NATIONAL AUDIT OFFICE

REPORT BY THE
COMPTROLLER AND
AUDITOR GENERAL

The Department of Trade and Industry's Support for Innovation

HC 715 Session 1994–95
4 August 1995

NATIONAL AUDIT OFFICE

REPORT BY THE COMPTROLLER AND AUDITOR GENERAL

The Department of Trade and Industry's Support for Innovation

ORDERED BY
THE HOUSE OF COMMONS
TO BE PRINTED
19 JULY 1995

LONDON: HMSO
HC 715 Session 1994–95
Published 4 August 1995

£9.70 NET

The Department of Trade and Industry's Support for Innovation

This report has been prepared under Section 6 of the National Audit Act 1983 for presentation to the House of Commons in accordance with Section 9 of the Act.

John Bourn
Comptroller and Auditor General

National Audit Office
5 July 1995

The Comptroller and Auditor General is the head of the National Audit Office employing some 750 staff. He, and the NAO, are totally independent of Government. He certifies the accounts of all Government departments and a wide range of other public sector bodies; and he has statutory authority to report to Parliament on the economy, efficiency and effectiveness with which departments and other bodies have used their resources.

Contents

Summary and conclusions

1. The Department of Trade and Industry (the Department) are chiefly responsible for implementing Government measures to stimulate innovation, defined as the successful exploitation of new ideas and new technologies, and increase industrial competitiveness. They do this through schemes designed to meet an identified market need. The schemes fall into the following two categories:

    - direct financial support by way of grants to companies to develop innovative technologies (**technology development**); and

    - indirect support by way of programmes or activities designed to facilitate technology access through the transfer of technology, technical skills and best practice, both in management and the application of technology (**technology access**).

2. The United Kingdom has a good record in basic research, but a relatively poor history of commercially exploiting those new ideas. Following the Department's last major review of innovation in 1993, they shifted the emphasis of their support from technology development schemes towards technology access activity. The percentage of their innovation expenditure devoted to technology access is likely to increase from 23 per cent to over 50 per cent in the period 1992-93 to 1996-97.

3. During 1993-94 the Department reduced the number of staff involved in the management of innovation schemes and reorganised the remaining innovation staff. In April 1994, the Department's regional offices were amalgamated with those of other Government Departments to form integrated regional offices (now called Government Offices) and the process began of transferring certain innovation services to a nationwide network of 200 Business Links.

4. Against this background of continuing change, the National Audit Office examined eight schemes under the general headings of technology development and technology access. The schemes examined are described in Figure A. At the time of the examination in early to mid 1994 the 1993 policy changes and the introduction of

Figure A: Summary of schemes examined by the National Audit Office

Technology Development	LINK	A multi-departmental scheme which supports industrially relevant collaborative research between industry and academia.
	SMART	A single small company grant scheme which aims to stimulate innovative and marketable products, run on the basis of an annual competition. (Small Firms Merit Award for Research and Technology)
	SPUR	A single small and medium sized company grant scheme designed to help firms develop new products and processes. (Support for Products Under Research)
	RIN	A single small company grant scheme for firms in designated geographical areas to develop commercially viable innovative products. (Regional Innovation Grants)
Technology Access	Biotechnology Means Business	A scheme which disseminates information to potential industrial users about the commercial potential offered by biotechnology.
	Manufacturing Intelligence	A scheme which disseminates information about the application and operational benefits of knowledge based computer systems.
	Teaching Company Scheme	A multi-departmental scheme which facilities the transfer of technology and skills from academia to business.
	Managing in the 90s	A scheme which disseminates information on management best practice, particularly on the need to innovate and manage change effectively.

Business Links had yet to take substantial effect. And, in May 1995, the Department's 1993 policy shift was re-affirmed in the Government's White Paper "Competitiveness - Forging Ahead".

5. The main features of the National Audit Office examination were:

   - A telephone survey of industry to ascertain industry's views of the Department's management of the schemes and industry's awareness of schemes. The survey also assessed the outcome of industry's participation in the schemes.

   - The formation of a working group, including representatives of the National Audit Office and the Department, to establish the comparative cost effectiveness of schemes. The methodology was based on an extension of decision theory which, by creating and then weighting a set of performance indicators, allows schemes to be evaluated in comparison to each other even when they are judged individually by different performance criteria.

The method does not offer an absolute measure of cost effectiveness but does establish the relative standings of the schemes examined.

Outcome of schemes and relative cost effectiveness

6. The main findings on the outcomes of schemes were as follows:

   a) Over half of completed technology development projects have been commercially exploited and a third patented.

   b) 60 per cent of participants in technology access schemes found them to be suitable for their needs and about one third of participants had taken action as a result of participating.

   c) Some 75 per cent of technology development projects were "additional" in that the companies perceived that they would not have gone ahead without the Department's financial support. Additionality ranged from 95 per cent for LINK to 59 per cent for SPUR.

   d) "Deadweight" is expenditure in excess of the minimum grant that companies would have required to have gone ahead with projects. For those companies in the survey in receipt of Departmental funding under the technology development schemes, the National Audit Office survey suggests that the Department incurred deadweight amounting to some £4.3 million. Estimates of deadweight ranged from 10 per cent of total support (RIN) to 53 per cent (LINK). It is not possible to eliminate all deadweight; and retrospective assessments by companies need to be treated with caution particularly those concerned with LINK.

7. The results of the comparative cost effectiveness work showed that seven of the schemes had similar levels of cost effectiveness but the eighth scheme, LINK, ranked significantly lower. This was principally due to the scheme's relatively high administration costs and lengthy grant application processing time: the scheme rated highly on many aspects of innovation. An analysis of the principal factors affecting the ranking of schemes showed that:

   a) although innovation and cost were assigned equal weight, the two individual indicators accorded most weight were "programme costs" and "running costs". This militated in favour

of the cheaper access schemes, as opposed to development schemes - and indeed four out of the five most cost-effective schemes were access schemes; and

b) within the group of innovation indicators, those relating to projects and products secured a higher weighting than those dealing with transfers of information.

8. These findings indicate scope to improve performance in two main areas:

- the design and evaluation of schemes; and
- the promotion and administration of schemes.

The Department's procedures in these areas are assessed in the following sections, and recommendations made for improvements.

Scheme design and evaluation

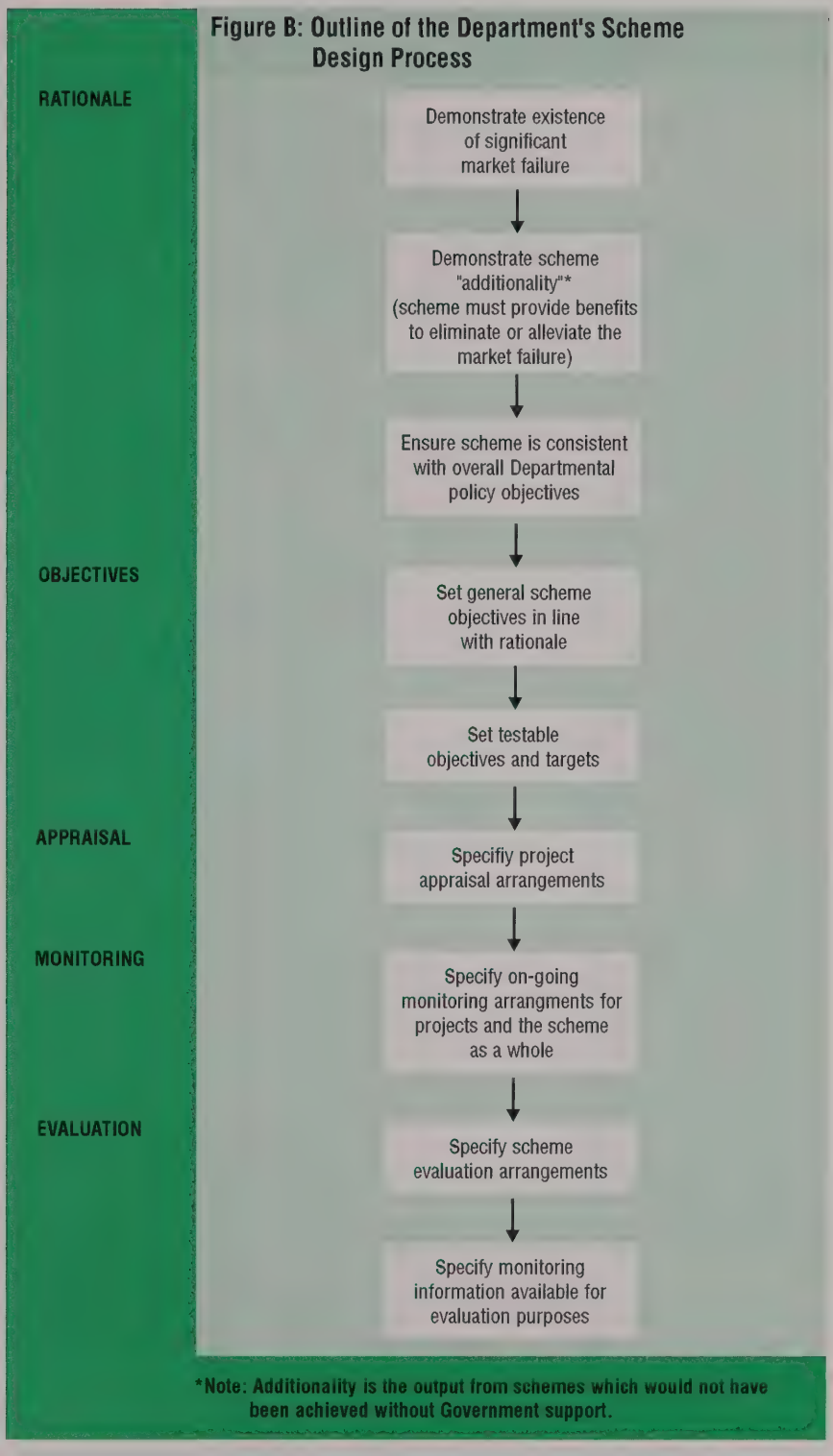
9. The Department had in place arrangements to review the overall balance of their portfolio of schemes through their annual planning round, and to evaluate the results of schemes. These arrangements have since been supplemented by measures designed to enhance the Department's ability: to judge cost effectiveness; to identify gaps and overlaps in their schemes; and to ensure that a standard core of monitoring data and evaluation results are available whilst schemes are in progress.

10. Scheme design decisions followed the approved processes (Figure B) and were generally well supported by information and analysis. In two cases examined where amendments to scheme design subsequently became necessary the Department had taken the necessary action. Objectives were usually set which were both commensurate with and, in seven cases, provided adequate or better coverage of the scheme's aims.

11. The National Audit Office noted that there was scope for improvement in the following areas:

a) Objectives for technology development were not always readily measurable and those for technology access were insufficiently focussed on outputs. The Department expect that their revised evaluation arrangements and improvements in the scheme design process will enhance the quality of their objective and target setting.

Figure B: Outline of the Department's Scheme Design Process



b) Variations in average "deadweight" between the technology development schemes indicates the need to look more closely at this aspect in the design of, particularly, schemes aimed at more complicated projects and medium sized and larger companies.

c) Variation in commercially successful outcomes between schemes is partly explained by the different nature of schemes. But two aspects may have common significance. The technology development scheme (SMART) which assesses the quality of applications more fully than the other three has the highest ratings for successful projects. Access schemes that are designed so as to facilitate implementation of new practices or technologies, such as the Teaching Company Scheme, rate higher than more general awareness schemes.

d) Evaluation arrangements, although good and improving, do not facilitate a robust comparison of scheme performance, and so it can be difficult to learn lessons from the different aspects of schemes' design and operation and assess the most cost effective resource allocation.

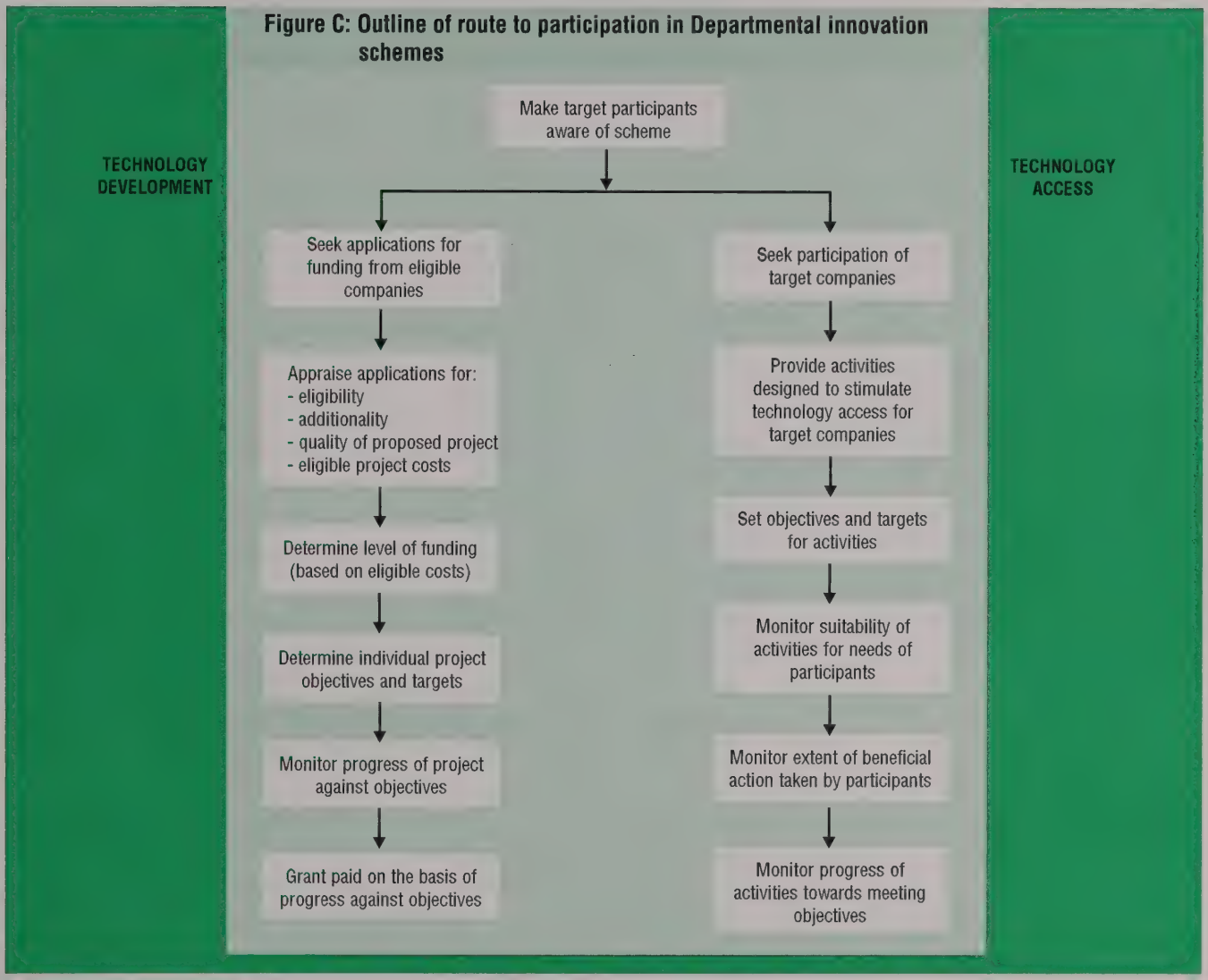
12. **The National Audit Office recommend that:**

- innovation scheme objectives should be analysed and reviewed as a whole as part of the annual planning and review arrangements, on the lines adopted by the National Audit Office for this study;
- the Department should consider adopting more flexible funding arrangements for schemes where "deadweight" would otherwise be high;
- the Department should explore the extension of graded assessments of the quality of applications from SMART to other technology development schemes;
- the Department should take on board the weight put on indicators of the implementation of new ideas and technologies in their reviews of the design and targeting of access schemes;
- the Department should investigate further the development and use of the comparative cost effectiveness methodology used in this study as part of their evaluation and resource allocation processes.

Scheme promotion and administration

13. Figure C provides an outline description of the grant application process for technology development schemes and the route to participation in technology access schemes.

Figure C: Outline of route to participation in Departmental innovation schemes



14. The Department promote awareness of the policy change and their schemes in a variety of ways: advertising, mailshots, direct contact with industry, via the work of Regional Offices; and, from 1993 on, via Business Links. The arrangement for managing the promotion of schemes varies in detail from scheme to scheme. In all cases, there is considerable delegation to regional and operational staff.

15. The National Audit Office found that:

    a) Although there was a relatively high level of awareness amongst industry for the SMART scheme, there were low levels of awareness for the other seven Departmental schemes, particularly those concerned with technology access.

    b) Understanding amongst industry of Departmental policies for support for innovation, or of the distinction between technology development and access support was low.

16. The National Audit Office examined how the Department administered the eight selected schemes. They found that, in general, schemes were well administered and in particular:

    a) grant applications were usually appraised in line with laid down procedures;

    b) eligibility requirements for schemes and the progress of schemes, funded projects, activities and events were, in most cases, well monitored.

17. Areas where there was scope for improvement included:

    a) the low industry awareness of many of the schemes examined, and the findings that for two access schemes a significant minority of participants were not drawn from the prime target audiences, both indicate scope for improvement in the promotion of schemes and their delivery to appropriate target audiences.

    b) the National Audit Office survey shows that most applicants had experienced some difficulties with the schemes. The most common complaints were of the time taken to process applications and of the difficulty and expense of making an application. The highest levels of complaint were with the time taken to process LINK applications. This finding is supported by a recent Office of Science and Technology evaluation - which has resulted in proposals to streamline the process.

    c) for most access events examined no participation fee was charged. The National Audit Office survey revealed industry willingness to pay for such events - a move which could reduce costs to the Department and help secure an appropriately committed audience. The Department are considering appropriate admission fees for such events.

d) the Department are unable to derive administrative costs for individual schemes from their information systems: the costs of schemes quoted in this report are estimates prepared by the National Audit Office with the Department's help. The lack of good costing information makes it more difficult to manage schemes cost effectively.

18. **The National Audit Office recommend that:**

- the Department should include scheme promotion and targeting activity in appraisal and review arrangements for all schemes;
- the Department should monitor industry awareness of the schemes and the policy change, and track the impact on awareness of initiatives such as Business Links;
- the Department should monitor the success of streamlining initiatives for LINK applications, and aim to apply any lessons learned more widely;
- the Department should modify their management information systems to provide better information on the costs of administering schemes.

Overall conclusion

19. In summary, the National Audit Office found that for the eight schemes examined the Department have had reasonable success in meeting their objectives, and that they had put in place a sound framework of management practices. There is scope, however, to build further on these arrangements to improve the overall cost effectiveness of the Department's support for innovation.

Part 1: Introduction

1.1 Industrial innovation can be defined as the successful exploitation of new ideas leading to new or improved products, services or ways of doing business. Innovation may be speculative or market driven. It requires good management and linkages across the range of corporate functions - research, design, development, marketing, sales, distribution, servicing and administration. It is not synonymous with invention although this may be part of the innovation process.

1.2 Whilst United Kingdom industry has a relatively strong track record in research, it has proved less successful in terms of commercially exploiting new ideas. A ranking of 22 member countries of the Organisation for Economic Co-operation and Development carried out by IMD Lausanne and the World Economic Forum shows that the United Kingdom was ranked 13th overall (Table 1) on the "world competitiveness scoreboard". In terms of the extent to which enterprises are managed in an innovative, profitable and responsible manner, the United Kingdom was ranked 16th.

Table 1: World Competitiveness Scoreboard: United Kingdom Balance Sheet 1993

UK Position	
4	Internationalisation - country's participation in international trade investment flows.
14	Science and Technology - scientific and technological capacity, success of basic and applied research.
16	Management - extent to which enterprises are managed in an innovative, profitable and responsible manner.
16	Infrastructure - adequacy of resources and systems to serve the basic needs of business.
20	People, Education and Skills - availability and qualifications of human resources.
13	Overall Average.

(Rank 1-top, 22-bottom)

Source: IMD/ World Economic Forum.

Table 1 shows the United Kingdom's overall ranking of thirteenth in world competitiveness out of 22 Organisation for Economic Co-operation and Development countries.

1.3 There are many reasons why firms may not innovate. Funding may be difficult to obtain or the required expertise and know-how may not be readily accessible. There may also be a reluctance on the part of the company to invest in activities that offer no short term return, or poor management may mean that successful research is not combined with other important features of the innovation process thus reducing the chances of successful commercial exploitation. Such factors may be particularly critical for small and medium sized companies. It may also be difficult for firms to acquire newly developed innovative technologies and processes from other companies which may be reluctant to share their knowledge with potential competitors. These sorts of constraints on industrial innovation are the basis for intervention by the Government.

The Department of Trade and Industry

1.4 The Department of Trade and Industry (the Department) are chiefly responsible for implementing Government measures to stimulate innovation and increase industrial competitiveness. They employ a number of measures designed to achieve these objectives. These can be categorised under the general headings of **technology development, technology transfer** and **best practice awareness**:

- technology development: a number of schemes exist to provide direct support by way of a grant to companies to assist with their development of new and innovative technology;

- technology transfer: indirect support is provided by way of schemes designed to facilitate the transfer of technology and technical skills between organisations;

- best practice awareness: indirect support by way of schemes designed to disseminate information on best practice in management and the use of technology.

Science, Engineering and Technology White Paper

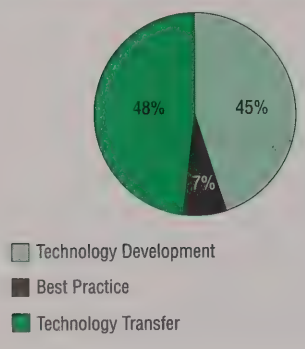
1.5 In May 1993 the Government published their White Paper "Realising our Potential - a Strategy for Science, Engineering and Technology" (Cm 2250). This reaffirmed the Government's aim to address the market environment that had resulted in the contrast between the United Kingdom industry's excellence in science and technology and its relative weakness in exploiting this for commercial advantage.

1.6 In parallel with the discussions leading up to the publication of the White Paper, the Department undertook a fundamental re-appraisal of their support for innovation. The main outcome of this was a shift in the balance of support away from generating new technology and towards the exploitation and transfer of technology and best practice awareness.

1.7 Their revised objective is therefore to stimulate innovation in industry by:

- promoting the importance of innovation and its management;
- encouraging research and development, the spread of best practice and the transfer and diffusion of technology and technical skills;
- encouraging interaction between industry and all other providers of technology, including academia, whether based in the United Kingdom or elsewhere; and
- funding research and development.

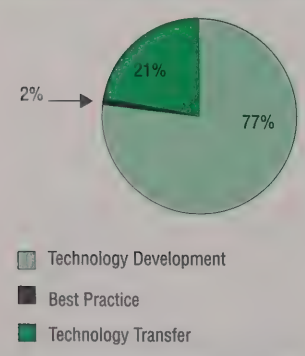
Figure 1: The Department's innovation expenditure target 1996-97



Source: The Department, March 1995

Figure 1 shows the targeted relative size of the Department's three main categories of innovation expenditure.

Figure 2: The Department's innovation expenditure 1992-93



Overall expenditure £153 million.
Source: The Department.

Figure 2 shows the relative size of the Department's three main categories of expenditure in the year immediately preceeding the policy change.

The implementation of the shift in policy emphasis

1.8 Although the shift in policy emphasis was announced in 1993 it could not be implemented immediately. In particular, the high level of commitment on existing schemes, some of which were closed to new applications from September 1993, means that residual spend will continue for a number of years. This means that any change has to be made progressively and it will be some time after April 1995 before expenditure from closed schemes ceases. However, the Department anticipate that by 1996-97, technology transfer and best practice awareness will account for over 50 per cent of the Department's expenditure directed towards support for innovation (Figure 1) against 23 per cent in 1992-93 (Figure 2). The Department also re-designated "technology transfer" and "best practice awareness" as "technology access", with effect from April 1994.

1.9 The approach towards support for innovation and the funding allocations of the European Commission and other developed countries are shown in the box opposite.

How the European Commission and other developed countries encourage innovation:

- Like the United Kingdom, the European Commission is placing greater emphasis on technology transfer although it continues to put the greater part of its funding into technology development projects. Support is provided both through the Commission's own schemes and by supporting those of member states. There is also an emphasis on support for smaller companies; and there has been a threefold increase in the support for biotechnology, mainly for dissemination.

- Other developed countries continue to emphasise technology development rather than technology transfer or best practice awareness. Nevertheless, all countries surveyed by the National Audit Office except Australia provide some support for technology transfer or best practice. The highest percentage of budget devoted to these aspects of support outside the United Kingdom is in Germany where the figure is 22 per cent.

Staffing and organisational changes

1.10 Figure 3 shows that the administration of the various schemes is split between the Department's headquarters and the regions. Policy work is concentrated at headquarters. During 1993-94 the Department reduced the number of staff engaged in managing innovation at their headquarters by some 90 posts. They also implemented a significant re-organisation of the remaining staff following the resignation of the Chief Scientist in February 1994. Technology functions were distributed amongst the Department's sector divisions. The budget remains centrally managed and a focal point for innovation is being maintained at senior management level.

1.11 In April 1994 the Department's regional offices were amalgamated with those of other government departments to form Integrated Regional Offices (now called Government Offices). The process was also begun of transferring the delivery of certain innovation services to industry from regional offices to a nationwide network of 200 Business Links. In the future these will be a major source of information for the business community and some innovation work will be based within them.

Figure 3: Schemes examined by the National Audit Office

	Description	Administered by	Expenditure (1) £Million
	Technology Development Schemes		
LINK	A multi-departmental scheme launched in 1986 involving nine Government departments and four Research Councils which supports industrially relevant collaborative research between industry and academia in a number of specified technologies. Available to companies of any size.	Headquarters(2)	49.8
SMART	A single company grant scheme run on the basis of an annual competition and open to firms with less than 50 employees. Support is available in two stages with the emphasis on feasibility in the first stage and prototype development in the second stage. The scheme aims to stimulate innovative and marketable products.	Regional Offices(3)/ Headquarters(4)	45.9
SPUR	A single company grant scheme designed to help firms with up to 500 employees (250 from September 1993) develop new products and processes which involve a significant technological advance.	Regional Offices(3)	14.8
RIN	A single company grant scheme available to firms with less than 50 employees in designated geographical areas for developing commercially viable innovative products.	Regional Offices(3),(5)	20.0
	Technology Transfer Schemes		
Biotechnology Means Business	This scheme disseminates information to potential industrial users about the commercial potential offered by biotechnology. The programme has involved two overlapping phases. The first phase ran for the three years to October 1993 whilst the second phase commenced in late 1992.	Headquarters	0.8
Manufacturing Intelligence	This scheme promotes the application of computer software technology of knowledge based systems to solve operational problems in: manufacturing technology and management; product design; marketing; distribution; and customer support and highlights the opportunities the technology offered for increasing competitiveness. The programme ran for three years to June 1993.	Headquarters	0.9
Teaching Company Scheme	A multi-departmental scheme launched in 1975 currently managed by a semi-autonomous body known as the Teaching Company Directorate on behalf of the Department and nine other public sector sponsors. The scheme provides technology access for companies and facilitates the transfer of technology and skills from academia to business by engaging graduates to work for a partnering company for two to three years.	Teaching Company Directorate	21.1
	Best Practice Awareness		
Managing in the 90s (Phase 2)	This scheme promotes management best practice in four key areas: production; purchasing; quality and design. It commenced in 1989 following the publication of the White Paper "The Department of Trade and Industry - The Department for Enterprise" (Cm 278). The scheme is currently in its second three year phase which commenced in 1992. This places a greater emphasis on the need to innovate and manage change effectively.	Headquarters/ Regional Offices	6.2

Notes:
(1) The Department's expenditure (excluding overheads) in the four years to 31 March 1994. Expenditure by other Government departments on LINK and the Teaching Company Scheme is excluded.
(2) Overall responsibility for LINK passed from the Department to the Office of Science and Technology in late 1993.
(3) The delivery of certain services currently undertaken by Regional Offices is progressively being transferred to Business Links.
(4) Headquarters are responsible for approving winning applications under SMART on the basis of appraisals prepared by the Regional Offices.
(5) The responsibility for the Department's RIN scheme passed to the Department of the Environment with effect from April 1994 (see paragraph 1.13)

Source: The Department

Figure 3 shows the general objectives and target groups of each scheme examined by the National Audit Office, their administrative arrangements and the level of spend over the four years to 31 March 1994.

Scope of the National Audit Office examination

1.12 Against this background, the National Audit Office examined:

- industry's awareness of Departmental innovation schemes (Part 2 of the report);
- the framework for and outcome of the Department's support for innovation (Part 3 of the report);
- performance indicators and the comparative cost effectiveness of the Department's innovation schemes (Part 4 of the report); and
- the efficiency of the administration of the Department's innovation schemes (Part 5 of the report).

1.13 This report focuses on eight innovation schemes designed to promote technology development, technology transfer or best practice awareness set out in Figure 3. These schemes were chosen because they are representative of the Department's innovation portfolio and, with the exception of the Manufacturing Intelligence scheme, which was closed down in June 1993, will continue to be funded in the future. LINK and the Teaching Company Scheme are multi-departmental but the National Audit Office's examination was concerned only with the parts of these schemes administered by the Department. The Department's Regional Innovation Grants scheme (RIN) became the responsibility of the Department of the Environment in April 1994. The National Audit Office's examination was concerned with the period prior to this transfer of responsibility.

1.14 The report also concentrates on the support available within the eight schemes for two particular technologies: biotechnology and advanced manufacturing. This enabled the National Audit Office to explore whether there were any significant differences in the impact of the Department's support for a specific technology, such as biotechnology or a more broad based technology, such as advanced manufacturing. The main features of their examination are set out in Figure 4.

1.15 The National Audit Office examination covered the four year period to March 1994 and was carried out in the first seven months of 1994. They acknowledge the willing assistance of all concerned.

1.16 Subsequently, in May 1995, the Government published their White Paper "Competitiveness - Forging Ahead" (Cm 2867). This developed further the shift in policy emphasis, set out in the 1993 White Paper

Figure 4: The main features of the National Audit Office examination

1: Survey of Industry

a: The National Audit Office commissioned IFF Research Limited to undertake a telephone survey (the Survey) of industry to ascertain:

- industry's views on and awareness of the change in policy emphasis and their awareness of the Department's programmes and schemes;
- industry's view of the Department's management of the programmes and schemes; and
- the outcome of industry's participation in the Department's programmes and schemes.

b: Of the 1,105 companies initially contacted for interview, a statistically representative sample of 660 companies from the advanced manufacturing and biotechnology sectors responded to the survey - representing an overall response rate of 73%, after taking account of those which did not qualify for interview.

c: The survey was designed to obtain a statistically valid sample of the views of companies falling into the following three categories:

- suppliers (or developers) of technology who had applied to the Department for financial assistance under one of four grant schemes during the period April 1990 to December 1993 (402 responses);
- developers who had not so applied (108 responses); and
- companies who were customers (or users) of technology developed by companies of the type described in the two categories above (150 responses).

The telephone survey was complemented by in-depth interviews with 20 companies. These provided evidence to amplify and illustrate the statistical findings of the survey. Appendix 1 provides further details of the survey

2: Comparative Cost Effectiveness

The National Audit Office established a joint working group with the Department to examine the comparative cost effectiveness of the innovation schemes set out in Figure 3. They commissioned Facilitations Limited and an academic consultant from the London School of Economics (Professor J. Rosenhead) to assist in this exercise. Appendix 2 gives summary details of the methodology and analysis.

3: Comparisons with Other Countries and Organisations

The following methodology was used to establish the approach adopted by other Government departments, other developed countries and the European Commission:

a: questionnaires were sent to 11 developed countries of whom nine responded;

b: National Audit Office staff visited the offices of the European Commission in Brussels and Luxembourg;

c: Interviews were held with other Government departments.

4: Case Examinations, Analysis and Interviews

The National Audit Office:

a: conducted interviews and the following 48 case examinations at the Department's headquarters in London and in two of their Regional Offices - West Midlands and Yorkshire and Humberside:

- 18 LINK projects (6 Biotechnology and 12 Advanced Manufacturing) from 9 LINK programmes; and
- 13 SMART, 10 SPUR and 7 RIN projects (15 Biotechnology and 15 Advanced Manufacturing) at the two Regional Offices.

b: interviewed staff of the Teaching Company Directorate (see Figure 3) and examined 12 Teaching Company Scheme programmes;

c: interviewed staff of the CBI;

d: examined recent Departmental evaluations of their innovation programmes and schemes; and

e: analysed scheme statistics over the period April 1990 to March 1994.

(paragraph 1.5), towards support for technology access and awareness of the importance of innovation as a key component of competitiveness.

Part 2: Industry awareness of Support for Innovation

2.1 This part of the report considers industry's awareness of the Department's schemes and the shift in policy emphasis.

Industry's awareness of the schemes and the shift in policy emphasis

2.2 In order to secure improved innovation, the Department must make relevant companies aware of the support and events available, as a precursor to their participation. In some cases, companies may benefit from departmentally-supported research and services without being aware of the underlying departmental effort. But for the schemes examined by the National Audit Office, the nature of support or event required pre-knowledge of the scheme itself.

2.3 Each of the eight schemes examined by the National Audit Office is marketed differently. Of the four technology development schemes, only SMART is advertised nationally in the press. Neither SPUR nor RIN is advertised: awareness of them is normally through contact with the regional offices who administer the schemes. Some calls for applications for LINK are made in technical journals but otherwise applications result from discussions with the Department.

2.4 Mail shots are normally used to contact potential participants for technology transfer or best practice awareness events.

2.5 Awareness of schemes and activities is obviously a pre-condition for participation. But awareness of the underlying rationale for support is also desirable, both to help companies see the value of the support offered, and to help them feed their ideas and needs to Government in a constructive way. Accordingly, throughout their 1993 review of innovation support the Department consulted companies about their proposals. And in May 1993 the Department set out to inform industry more generally of their decision and its impact on the existing schemes. Following a Parliamentary written answer a press release was issued explaining the changes and the President of the

Board of Trade wrote to a selection of companies. Apart from this, the main vehicle for marketing the changes was in the form of addenda to existing literature about the schemes, distributed in the normal way to potential applicants, and by selective mail shots. Regional office staff were provided with briefing packs summarising the changes to help them in the process of informing industry.

2.6 To assess whether, by these means, the Department were attracting the most relevant participants to their schemes and if industry was sufficiently aware of the shift in policy emphasis, the National Audit Office examined:

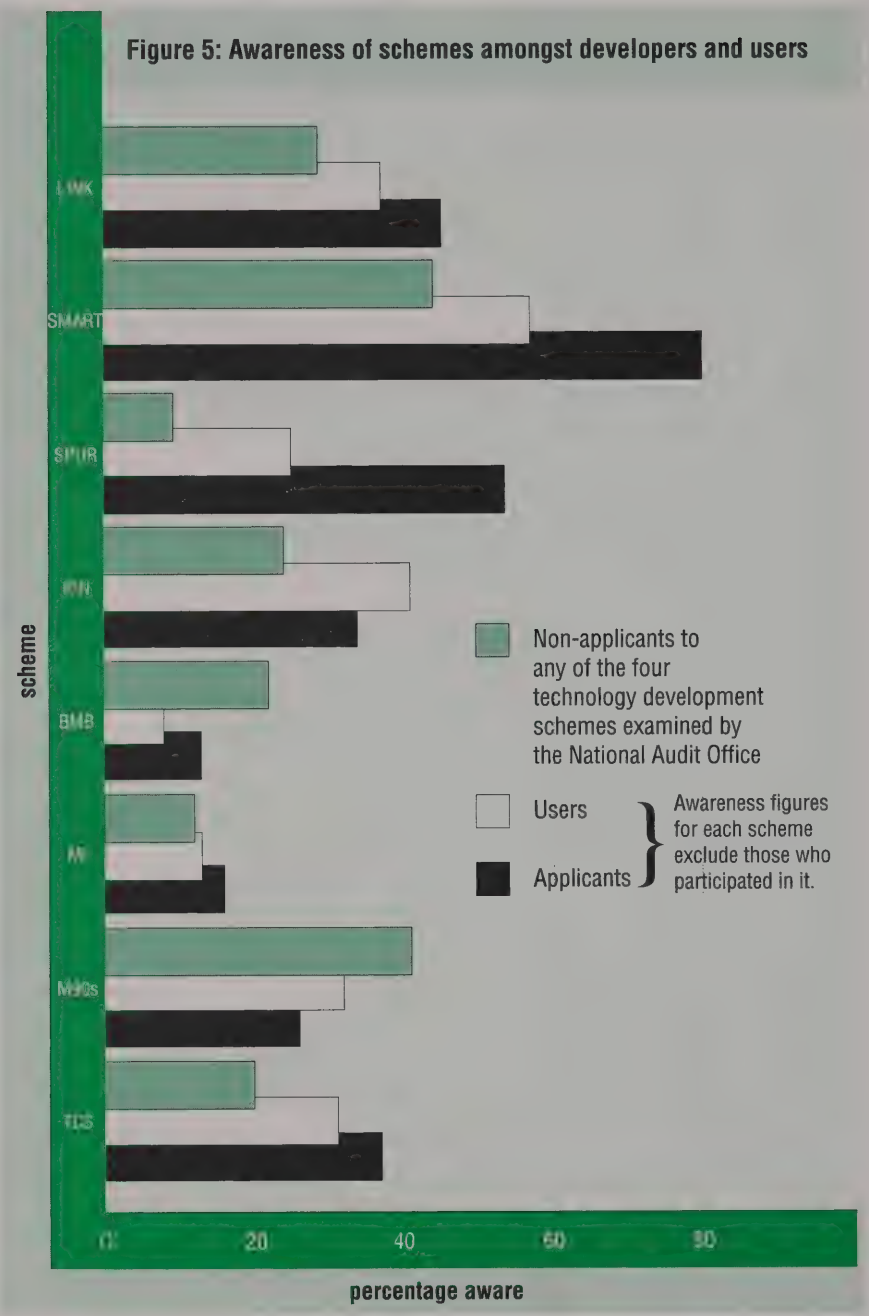
- whether a sufficient proportion of potential participants were aware of the eight schemes covered by this report (see Figure 3);
- industry's understanding of the difference between technology development, technology transfer and best practice awareness; and
- industry's awareness of the Department's shift in policy emphasis.

Industry's awareness of existing schemes

2.7 The National Audit Office survey in 1994 asked companies whether they had heard of the Department's existing schemes for stimulating industrial innovation, prompting them with the names of the schemes. It was likely, however, that fewer would have heard of RIN than the other technology development schemes because it is only available within designated geographical areas. Although Biotechnology Means Business should have been known to biotechnology companies there is no reason why general manufacturing companies should be aware of it. Also, Manufacturing Intelligence was of interest only to a limited part of the manufacturing sector. These factors are important in considering the results set out below.

2.8 Figure 5 shows that, with the exception of SMART, less than half of companies applying to a given scheme were aware of the Department's other schemes. This was irrespective of the size of the company or whether they were from the biotechnology or manufacturing sectors of industry. These findings were echoed in a survey undertaken by the British Chambers of Commerce in 1994. This found that well over half of their sample of 394 small firms were unaware of the Department's schemes open to them.

Figure 5: Awareness of schemes amongst developers and users



Source: National Audit Office survey.

Figure 5 shows the awareness of the Department's schemes amongst the 510 developers and 150 users interviewed as part of the National Audit Office survey.

2.9 As is to be expected, companies who were developers of technologies were more aware of technology development schemes than of technology transfer or best practice awareness schemes. More surprisingly, the same was true generally of users of technology who were no more aware of these schemes than

developers. They might be expected to have a greater awareness of the technology transfer or best practice awareness schemes which are designed to be more directed towards their needs.

2.10 The level of awareness amongst non-applicants was low generally. In the case of SPUR, the level of awareness was only 9 per cent.

2.11 Of the 402 technology developers surveyed who had made applications, over a quarter had been involved in more than one initiative over the three years to December 1993, possibly indicating a level of recycling of existing applicants.

2.12 Although there was a relatively high level of awareness amongst industry of the SMART scheme, industry's level of awareness was low for the other seven innovation schemes as at mid 1994. This low awareness, and the possible recycling of existing applicants for technology development schemes, introduces the risk that the Department are not always securing the best or most relevant applicants or participants. In the view of the National Audit Office the Department could significantly reduce this risk by spreading the knowledge of their schemes more widely. The costs of doing so will represent a small proportion of a scheme's overall costs and are likely to be outweighed by the benefits derived from attracting a greater number of the best and more relevant applicants or participants.

2.13 The Department expect the publication of the 1994 Competitiveness White paper, their increased use of industrial secondees and the increasing network of Business Links, to have increased industry's awareness of their innovation schemes since the National Audit Office survey in 1994. The National Audit Office recommend that the Department should monitor closely the impact of these measures in securing increased industry awareness of their innovation schemes.

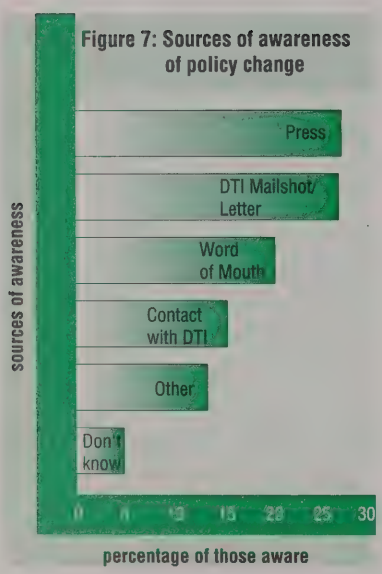
Industry's awareness of the difference between technology development; technology transfer and best practice awareness

2.14 The difference between the concepts of technology development, technology transfer and best practice awareness is not easy to grasp. It is important, however, that the distinction is understood by potential applicants if they are to benefit from participation in schemes which are most likely to meet their needs. The National Audit Office therefore examined whether industry is aware of the difference between the concepts.

2.15 Of those surveyed in 1994, 30 per cent claimed to be fully aware of the differences with a further 26 per cent being partially aware. Over two-thirds of the respondents to the survey were unaware of the difference between technology transfer and best practice awareness. There was no statistically significant difference between developers and users of technology, or between those who had applied to the Department and those who had not. This latter finding is of concern since it demonstrates that the Department have not succeeded in clarifying the distinction for companies who are in contact with them. The Department have subsequently re-designated both technology transfer and best practice awareness as technology access (see paragraph 1.8).

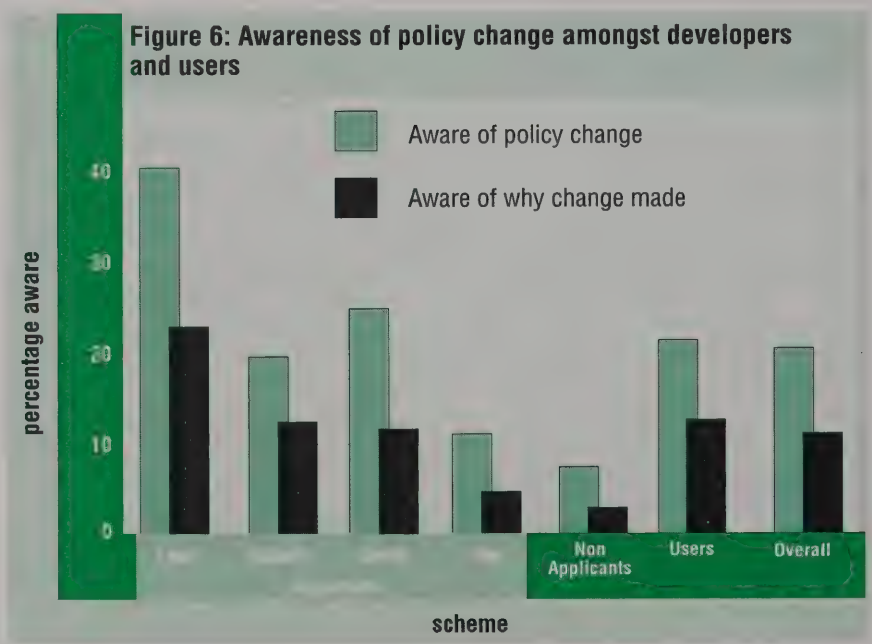
Industry's awareness of the shift in policy emphasis

2.16 The National Audit Office found that 20 per cent of those surveyed in 1994 were aware of the shift in policy emphasis and of these just over half claimed to be aware of why the Department had made the change. Figure 6 shows how awareness varied between the different groups surveyed and Figure 7 the sources of their information.



Source: National Audit Office survey.

Figure 7 shows the sources of awareness of the policy change amongst the companies aware interviewed as part of the National Audit Office survey.



Source: National Audit Office survey.

Figure 6 shows the awareness of the Department's change in policy emphasis amongst the 660 companies interviewed as part of the National Audit Office survey. In particular it shows the low awareness overall.

2.17 Recent measures, such as the introduction of Business Links, should help to raise industry awareness of the Department's policies and schemes. But the Department should monitor industry awareness and track the success of recent initiatives in securing higher awareness.

Part 3 : The framework for and outcome of the Department's Support for Innovation

3.1 The National Audit Office examined the key elements of the framework set by the Department for their support for innovation and the outcome of that support.

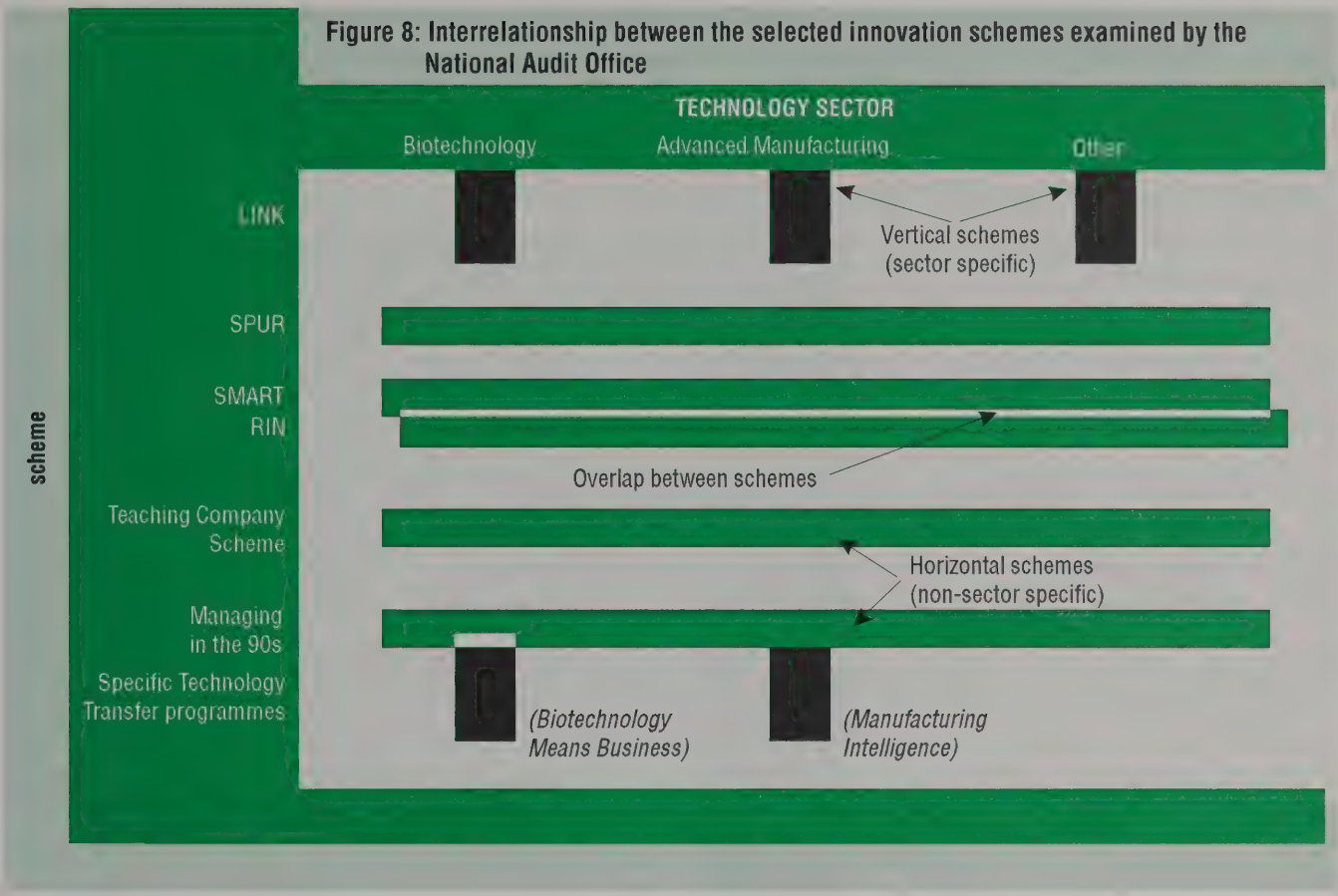
The Department's Innovation portfolio

3.2 The inter-relationships between the schemes in that part of the Department's innovation portfolio examined by the National Audit Office is illustrated in Figure 8. This shows the cross sector overlap between SMART and RIN which results in failed SMART applicants in certain designated geographical areas being automatically considered for RIN. It also shows the sector specific overlap between the Managing in the 90s and Biotechnology Means Business schemes which reflects the support both schemes provide for raising industry's awareness of best practice.

3.3 At the time of the National Audit Office fieldwork in early 1994, the Department had in place arrangements to review the overall balance of their portfolio of innovation schemes through their annual forward planning round. Subsequently, the Department have introduced measures to improve their scheme portfolio design and resource allocation.

3.4 The revised system first involves identifying the overall gaps and overlaps in their portfolio of schemes by taking account of their character as either "horizontal" or "vertical" in nature in the manner illustrated in Figure 8. The position of both new scheme proposals and existing schemes within this framework will be identified and each will be systematically assessed against policy criteria and awarded merit values which will help to determine resource allocations. The Department are also considering adoption of the methodology used in the National Audit Office work on comparative cost effectiveness to assist with resource allocation.

Figure 8: Interrelationship between the selected innovation schemes examined by the National Audit Office



Source: National Audit Office.

Figure 8 shows the sectoral interrelationship between the eight selected innovation schemes examined by the National Audit Office. In particular it shows the overlap between SMART and RIN in those designated geographical areas for which funding is available under RIN. This overlap is however non-sector specific.

Rationale for the schemes

3.5 As part of the arrangements for design of a scheme, the Department examines the economic rationale for the scheme. Pre-conditions for intervention include the identification of a significant market failing within the Department's remit for action; the possibility of a scheme being devised to stimulate additional activity which will combat the failing; and the ability of participants to exploit the outcomes of intervention. This process includes an assessment of the characteristics of the companies to be targeted in terms of their size and industrial sector. The rationale is set out in a document known as a ROAME statement, which also specifies the objectives and targets for the scheme and the arrangements for project appraisal, on-going monitoring and the evaluation of the scheme.

3.6 The National Audit Office noted that, in general, there was an adequate assessment of the economic rationale for all eight schemes they examined. Table 2 below and Figure 8 show the key elements of the rationale for these schemes in terms of the characteristics of the target companies and technology sector.

Table 2: Size and type of firms targeted

Scheme	Target Firms	
	Company Size	Company Type
LINK	Non specific	Developer
SMART	Small	Developer
SPUR	Small & medium	Developer
RIN	Small	Developer
Biotechnology Means Business	Small & medium	User
Manufacturing Intelligence	Medium	User
Managing in the 90s (phase 2)	Majority small or medium	Non specific
Teaching Company Scheme	Majority small or medium	Non specific

Source: The Department's ROAME Statement for each of the Schemes.

Table 2 shows the characteristics of the firms to be targeted by each scheme.

3.7 The precise design and specification of schemes must be based on forecasts of future industry status and needs, drawn from current information that is not of itself comprehensive or ideal for the purpose. Monitoring and evaluation of schemes as they progress are therefore necessary ingredients to help counter initial uncertainties of design, as well as to reflect changed external circumstances. Two of the schemes examined illustrate the difficulties of maintaining good scheme design.

3.8 For both Managing in the 90s and the Teaching Company Scheme, monitoring and evaluation activity has revealed the need to target particular audiences within overall scheme boundaries to secure best value for money. It is notable that only the more recent monitoring and evaluation activities have revealed the need for

change. This reinforces the desirability of the improvements the Department are making to their monitoring and evaluation processes.

Objectives and whether they have been met

3.9 A key feature of scheme design is the extent to which objectives are set which are both commensurate with and provide adequate coverage of the schemes' aims. Performance against specific objectives and targets should also be readily measurable and, where it is practicable to do so, objectives should be output orientated. The National Audit Office analysed these aspects of scheme design for the eight schemes covered by this report. They also assessed whether performance against objectives had been measured and whether the stated specific objectives had been met. Objectives and targets for each of the eight schemes are set out in Appendix 3.

Compatibility with Departmental objectives and coverage of scheme aims

3.10 Save for the LINK scheme, the National Audit Office found that objectives and targets were set which were commensurate with Departmental objectives. They also judged that the objectives provided average to good coverage of scheme aims.

3.11 For LINK, although general overall scheme objectives were set and each programme within the scheme has its own objectives, the Department had not put in place more specific overall objectives for the portfolio of LINK programmes they support.

Output orientation and measurability of objectives

3.12 In overall terms the National Audit Office judged the objectives and targets to be of average output orientation and good measurability. There were, however, significant variations between technology development on the one hand and technology transfer and best practice awareness on the other as set out below.

3.13 Although some specific output orientated objectives and targets had been identified in all cases except for the Teaching Company Scheme, the balance of coverage for technology transfer and best practice awareness schemes was predominantly input orientated.

3.14 The relative lack of output orientated objectives for technology transfer and best practice awareness can, to some extent, be attributed to the Department's difficulty in defining readily

measurable output measures for such schemes. Such outputs are usually "soft" in nature and more difficult to isolate and attribute to the Department's support, whilst outputs for technology development are usually identified more readily in terms of projects completed and commercially exploited.

3.15 The measurability of objectives for the four technology transfer and best practice awareness schemes were judged by the National Audit Office to be good, compared with average for the four technology development schemes. This is attributable to the predominance of input objectives under the technology transfer schemes as these are typically easier to measure.

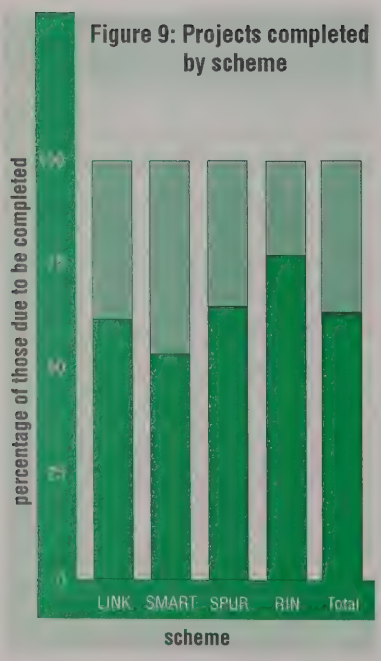
Achievement of objectives

3.16 Most measurable objectives had been measured and virtually all had been achieved. In cases where such objectives have not been measured this is generally because it is too early to do so.

Performance indicators

3.17 Although the Department maintain a wide range of performance indicators on a scheme by scheme basis these are predominantly input based, covering aspects such as the number of grant applications received or the number of participants in technology and best practice events. Output data are collected as part of the formal evaluation system but not for all schemes nor all aspects of an individual scheme. In the view of the National Audit Office output data need to be collected more systematically and performance indicators need to be improved, in particular more output orientated ones should be developed. They note that the Department's revised evaluation arrangements (paragraph 4.3) together with the work on comparative cost effectiveness should provide a mechanism for improving the quality of output data and performance indicators generally.

Figure 9: Projects completed by scheme



Source: National Audit Office survey.

Figure 9 shows the percentage of those companies in receipt of funding that had completed their projects and the percentage whose projects had been extended or failed.

Outcome of support for schemes: technology development

Projects completed

3.18 The National Audit Office examined the completion rate for projects within each of the four technology development schemes. In their survey they asked developers who had received funding from the Department whether their project had been successfully completed. Figure 9 shows the percentage of projects completed on schedule

and those which had failed or been extended under each scheme. This shows that RIN had the highest rate of completions on schedule (77 per cent) whilst SMART had the lowest (54 per cent). It should be borne in mind that project extensions do not generate additional costs for the Department.

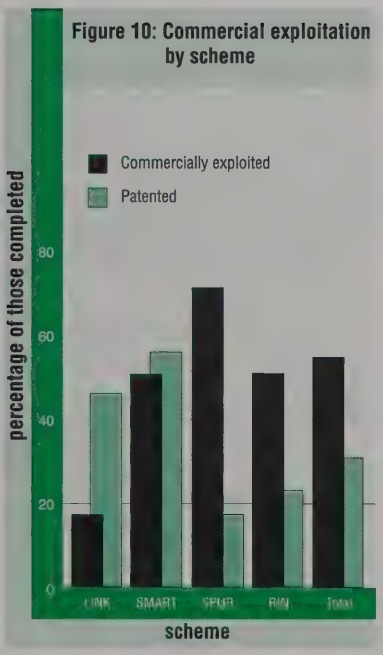
Commercial exploitation and patents

3.19 Two measures of a successful outcome of a completed project are: its commercial exploitation; and the registration of a patent, although either might take many years to achieve from the inception of the project.

3.20 The National Audit Office asked developers who participated in their survey whether they perceived their project to be near market, with an identified commercial prospect, or far market. Over 80 per cent of respondents saw SMART, SPUR and RIN projects as near market whereas only just over half saw LINK projects as near market. This latter result is consistent with the pre-competitive nature of the LINK scheme. However, the average expected time to commercial potential being realised from the start of the project was surprisingly low: nearly four years for LINK; nearly three years for SMART and SPUR; and two years for RIN.

3.21 Of projects completed, over half had been commercially exploited and a third patented. Figure 10 analyses these results by scheme. It shows that SPUR has the highest rate of commercial exploitation whilst LINK has the lowest. SMART has the highest rate of patenting whilst SPUR has the lowest. These results are compatible with the stated objectives of the schemes in terms of the distance from market at which the schemes operate. The National Audit Office noted that the survey results for commercial exploitation are broadly in line with the Department's own evaluation results for these schemes.

Figure 10: Commercial exploitation by scheme



Source: National Audit Office survey

Figure 10 shows the extent to which companies funded by the Department and interviewed as part of the National Audit Office survey had commercially exploited or patented their projects. In particular it shows the high commercial success rate for SPUR and the high patenting rate for LINK and SMART.

Additionality and deadweight

3.22 The National Audit Office examined the following two key measures of the outcome of the Departments support:

- additionality - an activity is additional if it would not have taken place in the absence of Departmental support. There are two levels of additionality. The first of these is the extent to which the scheme as a whole is additional and the second is the extent to which individual projects are additional; and

- deadweight - the difference between the actual funding received and the minimum necessary to encourage companies to proceed with the project.

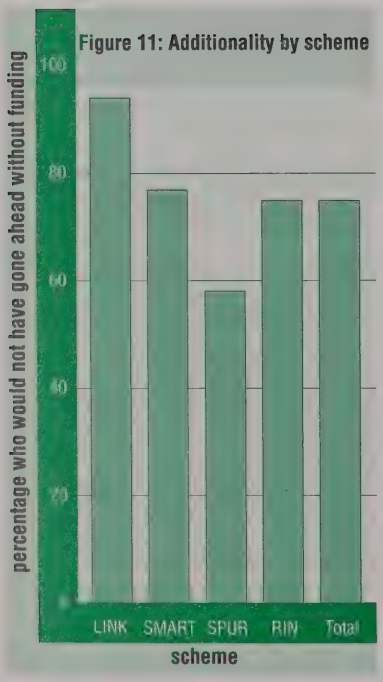
Additionality

3.23 The overall additionality of a scheme is a key aspect of its rationale - that is whether the scheme is providing a necessary market need which the market itself is unable to provide (see paragraph 3.5). The Department therefore attach equal importance to overall scheme additionality in all schemes. However, the extent to which the Department use the application appraisal process to test the expected additionality for individual projects is determined by the balance between the size of the grant and the administration costs associated with application appraisal activity. Accordingly, expected additionality is a key criterion in assessing applications for the LINK scheme, which aims to bring together a consortium from academia and industry to develop innovative technologies, and also for applications under the SPUR scheme. The Department attach less importance to additionality in assessing applications for SMART and it was not a criterion in their selection of RIN projects.

3.24 Three-quarters of developers in receipt of Departmental funding under the four technology development schemes and surveyed by the National Audit Office perceived that they would not have proceeded with their project without funding from the Department. Figure 11 shows the range of responses by scheme. It should be noted that, under the definitions adopted, a project could rate as additional even if the company received more funding than was necessary to stimulate the project.

3.25 The lower additionality for SPUR than for SMART or RIN appears to be at variance with a key criterion for that scheme. However the SMART and RIN schemes are targeted at smaller companies than is SPUR; and grant paid under those schemes is likely to represent a higher proportion of company turnover (Figure 12). That in turn makes it more likely that companies could not proceed without Government support, because of difficulties in raising the necessary finance. Moreover, an evaluation report by the Department showed that a significant proportion (28 per cent) of SPUR proposals would have been delayed or extended without Departmental support. This "partial additionality" is greater in the case of SPUR than other schemes. The National Audit Office noted that these findings are broadly comparable with the Department's evaluation of technology development schemes generally.

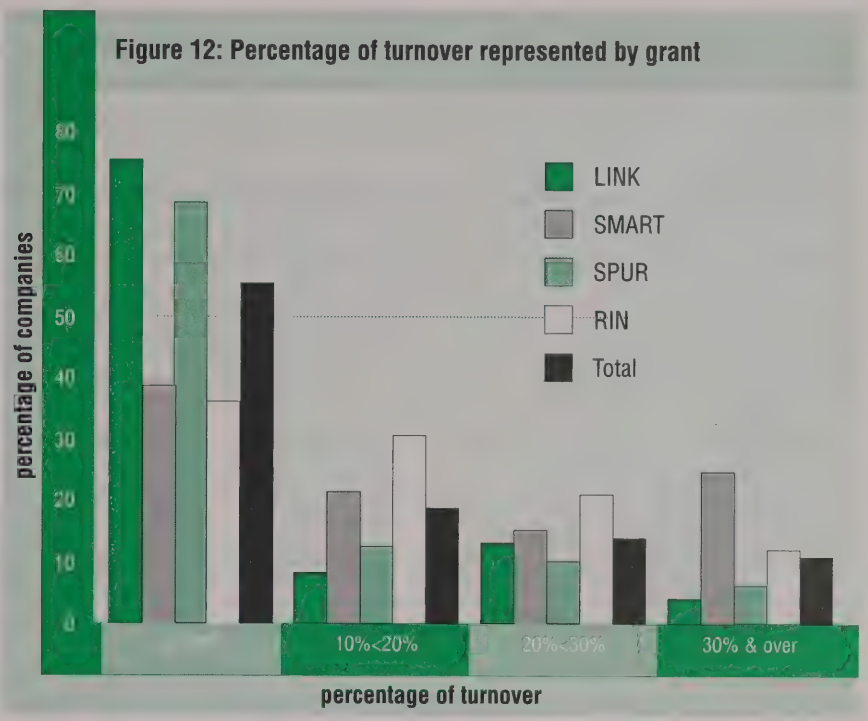
Figure 11: Additionality by scheme



Source: National Audit Office survey.

Figure 11 shows the percentage of companies in receipt of funding from the Department that perceived that they would not have gone ahead without funding or "additionality". In particular it shows the high additionality for LINK and the relatively low additionality for SPUR.

Figure 12: Percentage of turnover represented by grant



Source: National Audit Office survey.

Figure 12 shows the percentage of turnover represented by grant for the 289 companies in receipt of funding interviewed as part of the National Audit Office survey.

Table 3: Overall Deadweight by Scheme[1]

Scheme	Total Survey Deadweight £m	Estimated overall Annual Deadweight[2] £m
LINK	2.3	8.1
SMART	0.4	3.5
SPUR	1.4	1.8
RIN	0.1	0.5

Notes: (1) See note (1) to Figure 13.
(2) Estimated overall annual deadweight is based on average programme expenditure over the three years to March 1993. LINK should be treated with caution for the reasons set out in paragraph 3.27.

Source: National Audit Office.

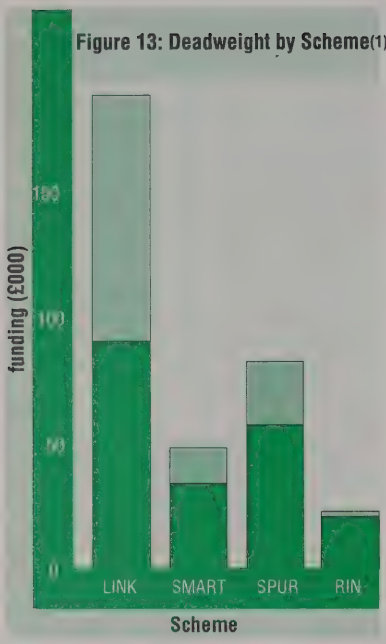
Table 3 shows the significant variation in the overall deadweight between the schemes.

Deadweight

3.26 As part of their survey the National Audit Office asked companies in receipt of a grant what was the minimum level of funding they would have required to have gone ahead with the project. The stated minimum was then compared with the funding received to see if the Department were providing grants in excess of those necessary to ensure the projects proceeded, that is "deadweight". Table 3 shows the total deadweight identified in the survey and the National Audit Office's estimate of total annual deadweight and Figure 13 overleaf shows the average amount of deadweight by scheme. There is a general risk in surveys of this type that respondents are likely to be overly conservative in their estimate of the minimum funding required. Hence deadweight is likely to be greater than that reported.

3.27 A number of participants in the survey, particularly universities and large manufacturing companies who had received grants under the LINK programme, said they would have needed higher grants to proceed although, in fact, they had gone ahead with their projects. Their responses have been excluded from the analyses in Table 3 and Figure 13. Furthermore, some of the companies or universities

Figure 13: Deadweight by Scheme(1)



KEY

- Average minimum required
- Average deadweight (average funding received (see note 2) less average minimum required)

Notes: (1) This analysis excludes those survey respondents that proceeded with their project despite stating that they required more funding to proceed than they in fact received (paragraph 3.27).

(2) The overall bar length represents the average funding received.

Source: National Audit Office survey.

Figure 13 shows the significant variation in average deadweight between the schemes. In particular it shows the apparently high deadweight for LINK compared with RIN.

surveyed who had received grants under the LINK scheme may have been referring to the total project cost rather than their own share of it: the results for LINK should therefore be treated with caution.

3.28 Because of the definition adopted for additionality and deadweight a project which was additional can also carry deadweight if the company received funding in excess of the minimum required to proceed. It is therefore possible for a scheme to have both high additionality and high deadweight, as is the case for LINK.

Outcome of support for technology transfer and best practice awareness

Impact of participation in schemes

3.29 The National Audit Office surveyed companies who had participated in technology transfer and best practice schemes and asked whether changes had been made to their business as a result of their participation in Departmental schemes, and if any such changes had made them more competitive. Their responses are analysed in Figure 14 opposite. This shows that some 60 per cent of participants found the events suitable for their needs and that 30 per cent of participants had taken action as a result. In the majority of cases the companies concerned perceived that the changes had made them more competitive. Typical responses are shown in the box.

"We gained knowledge in the selection of equipment. We now know better what we are looking for."

"We got interesting ideas on how to exploit our technologies."

"(It) has improved management skills in both communication and awareness of commercial issues."

3.30 The 1994 survey findings in Figure 14 represent worthwhile results which are broadly in line with typical Departmental objectives for such schemes. They are also in line with the results of a Departmental evaluation in 1992 - which suggests the Department will need to take specific action if they wish to raise levels of relevance and successful outcomes.

3.31 The National Audit Office identified two sorts of improvements which could be made:

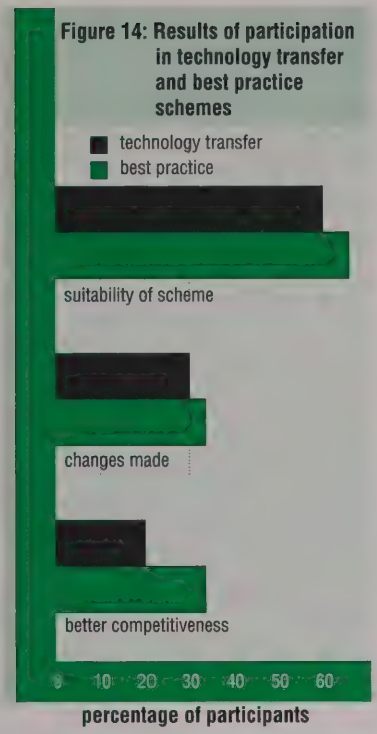


Figure 14: Results of participation in technology transfer and best practice schemes

Source: National Audit Office survey.

Figure 14 shows the suitability ratings achieved by technology transfer and best practice schemes and the worthwhile results for improved competitiveness ratings.

- greater awareness of the schemes could enhance their cost effectiveness by widening appropriate participation and thus spreading costs over a greater number of participants; and

- for the two technology specific schemes, Biotechnology Means Business and Manufacturing Intelligence, a significant minority of participants were not drawn from the prime target audiences. The cost effectiveness of these schemes could have been improved if the selection process for participants were better defined (paragraph 4.16).

Admission costs to events

3.32 Participants in technology transfer or best practice schemes examined by the National Audit Office were not required to pay for admission save for a fee of up to £60 for participating in certain Managing in the 90s seminars. In their survey the National Audit Office asked companies whether they would be willing to pay to participate in such events. Around half said they were prepared to pay to participate in technology transfer events and two-thirds to participate in best practice initiatives. The average amount companies were willing to contribute was about £170 per event. Following the results of the National Audit Office survey the Department are considering appropriate admission fees for these events. The National Audit Office welcome this.

Part 4: Evaluation of schemes and their comparative cost effectiveness

4.1 The National Audit Office examined the Department's evaluation process to determine whether it provided an adequate mechanism for judging the Department's performance. They also considered the relative cost effectiveness of the Department's schemes.

Evaluation

4.2 The Department aim to undertake formal evaluations of all major expenditure schemes to inform policy making and programme management on a scheme by scheme basis. Most of the schemes considered in this report have been recently evaluated in full. The exceptions to this are: LINK, for which a number of individual programmes within the scheme have been evaluated; and RIN which was last evaluated in 1991.

4.3 Recognising the need to adopt existing best practice more widely, the Department introduced revised evaluation arrangements in late 1993 which were designed primarily to integrate the evaluation process and resource allocation management (see paragraph 3.3) with the arrangements for the on-going monitoring of schemes. These arrangements should enable the Department to identify and collect a standard core of monitoring data and ensure that evaluation results are available whilst schemes are in progress, so as to achieve the maximum impact on policy and scheme development. They should also help to ensure that the rationale and objectives for schemes are defined as rigorously as possible in advance. Standard detailed evaluations will continue to be carried out for some schemes. These revised arrangements are similar to those used by the European Commission and will be fully operational by 1996.

4.4 The revised arrangements are primarily concerned with the evaluation of individual schemes, although there are provisions within them to examine, on an ad-hoc basis, specific issues which cut across a number of schemes. Whilst the National Audit Office support these arrangements they note that there is no provision in them systematically to evaluate the relative cost effectiveness of schemes in overall terms. In their view this limits the Department's ability to learn lessons from different aspects of schemes' design and operation and to determine the most cost effective allocation of resources between them.

Comparative cost effectiveness

4.5 The Department formed a joint working group (the Group) with the National Audit Office early in 1994 to identify a more comprehensive range of indicators than then employed and a methodology for assessing the comparative cost effectiveness of the eight selected schemes. Detailed terms of reference for the Group are set out in Appendix 2.

4.6 The approach adopted by the Group, developed by the consultants commissioned by the National Audit Office, is based on an extension of decision theory. It is set out in Appendix 2.

4.7 The output from this Group's work on comparative cost effectiveness is not definitive and the results should be interpreted and used with caution. It does, however, provide an indication of the relationship between the cost of a scheme and the amount of innovation and competitiveness it delivers. The methodology therefore provides a management tool which could help in diagnosing potential problems and pointing to possible courses of action to alleviate them.

Development of appropriate performance indicators

4.8 Two over-arching objectives were identified:

- minimising costs; and
- maximising innovation and competitiveness.

It is the balance of these that determines the comparative cost effectiveness of any particular scheme. To develop performance indicators, these objectives were each broken down into a number of specific criteria. Each criterion could be measured by performance indicators. Seven criteria and 19 performance

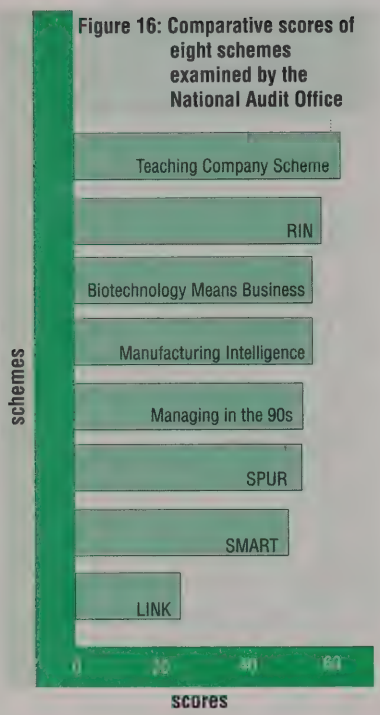
indicators relating to them were developed for the model. Some were already used by the Department. The criteria and performance indicators are set out in Figure 15 opposite.

Ranking of schemes

4.9 The Group determined overall scores for the cost effectiveness of each scheme. The results are set out in Figure 16. This shows that, overall, the Teaching Company Scheme is most preferred (61) followed by RIN (57). LINK is the least preferred (25).

4.10 To gain a better picture of cost effectiveness, the scores for "costs" and "innovation" need to be considered separately; this is shown in Figure 17. Schemes lying on the curve can be considered to be delivering innovation at relatively low cost; those inside the curve may be performing less cost effectively. Figure 17 shows that all of the schemes save LINK lie on or just inside the curve.

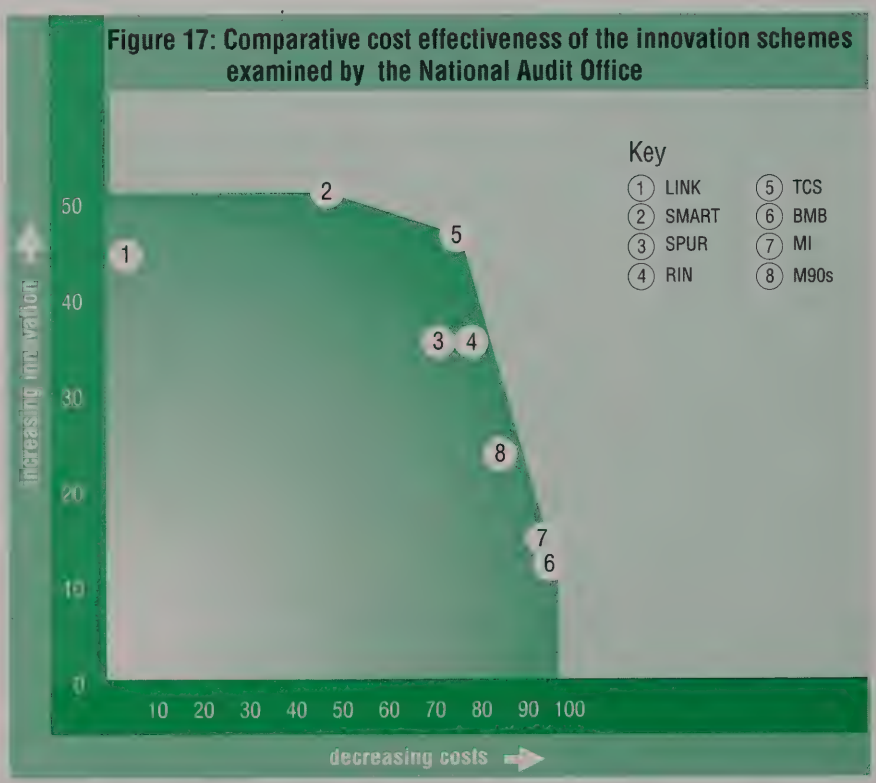
Figure 16: Comparative scores of eight schemes examined by the National Audit Office



Source: The Group.

Figure 16 shows the scores achieved by the eight schemes examined by the National Audit Office under the comparative cost effectiveness model. In particular it shows the relatively low score achieved by LINK compared with the other seven schemes examined.

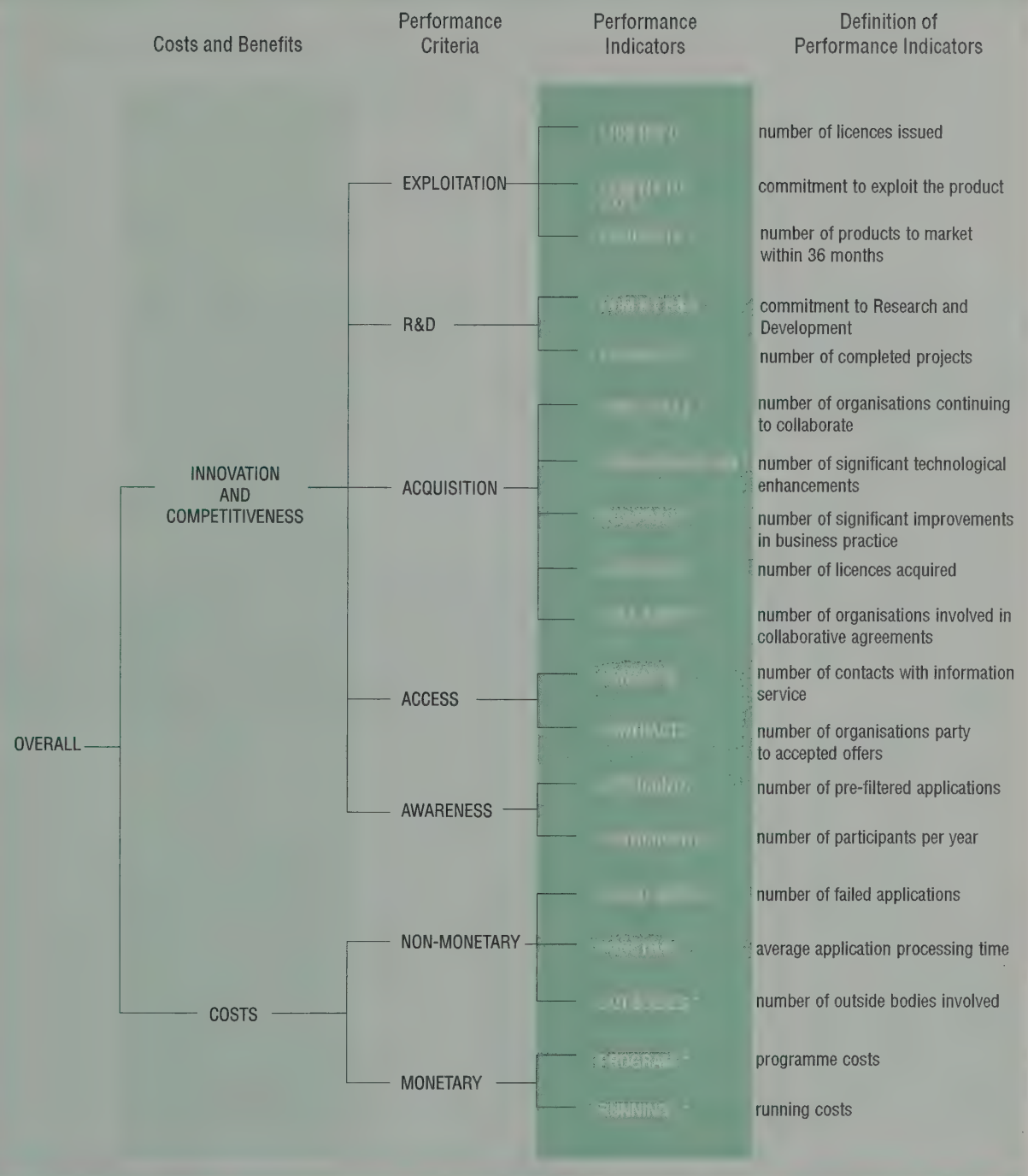
Figure 17: Comparative cost effectiveness of the innovation schemes examined by the National Audit Office



4.11 By carrying out a sensitivity analysis on these results and drawing upon the relevant findings set out in the earlier parts of this report the National Audit Office examined further:

- the effect of changes in the balance between cost and innovation on the ranking of schemes;

Figure 15: Hierarchical representation of performance criteria and indicators



**Identifies the 12 most important indicators (see paragraph 4.14).*

Source: The Group.

Figure 15 shows the hierarchical structure of the comparative cost effectiveness model. In particular it shows the interrelationship between the individual performance criteria and their related performance indicators and the latter's definitions.

- the principal factors which have determined the ranking of schemes; and
- how improvements in the schemes might be secured.

Effect of changes in the balance between cost and innovation

4.12 The results shown in Figures 16 and 17 are based upon equal weights being assigned to the overall criteria of cost and innovation.

4.13 The effect on these results of changes to this balance between cost and innovation are shown in Table 4. This demonstrates that the rankings are dependent upon the relative importance placed on costs or innovation. As costs become more important technology transfer and best practice awareness initiatives are rated more highly than grant schemes, with the exception of RIN. However the ranking for LINK is unaffected by wide variations in the balance of preference for costs or innovation.

Table 4: Impact of changes in the balance of costs and innovation

Programme	Overall weight on costs		
	25%	50%	75%
Teaching Company Scheme	55 (1)	61 (1)	68 (5)
RIN	47 (3)	57 (2)	69 (4)
Biotechnology Means Business	34 (7=)	55 (3=)	79 (1)
Manufacturing Intelligence	35 (6)	55 (3=)	77 (2)
Managing in the 90s	40 (5)	54 (5)	71 (3)
SPUR	44 (4)	53 (6)	64 (6)
SMART	52 (2)	50 (7)	49 (7)
LINK	34 (7=)	25 (8)	15 (8)

Source: The Group and Facilitations Ltd.

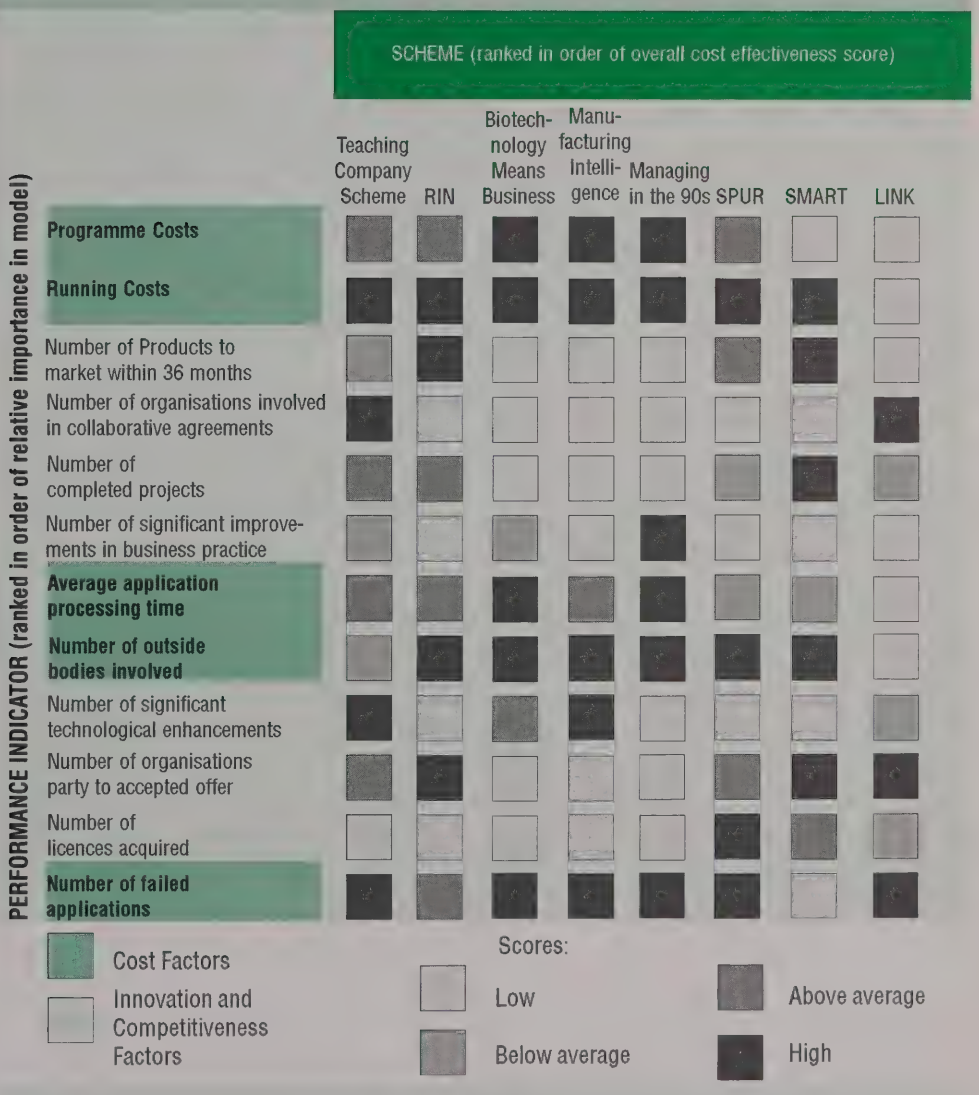
Note: The figures in the table represent the scores for each scheme under two further options: 25% weight on costs (low preference) and 75% weight on costs (high preference). Rankings are shown in brackets for each scheme.

Table 4 shows the effect of changes in the balance of preference for costs and innovation on the weighted average score for each scheme.

Principal factors contributing to the ranking of the schemes

4.14 Sensitivity analysis suggests that 12 of the 19 performance indicators will provide a model 96 per cent similar to the one developed using all 19. Table 5 illustrates the performance of each of the schemes against the 12 key indicators. The Teaching Company Scheme achieves its high ranking principally because it performs well across a wide range of performance indicators: in particular, its unit costs are relatively low; processing time is

Table 5: Principal factors contributing to the ranking of the schemes



Source: Facilitations Limited and the National Audit Office.

Table 5 shows the "Preference Scores" (see Appendix 2) achieved by each scheme on each of the 12 most important performance indicators. In particular it shows the relatively poor scores achieved by LINK compared with the relatively high scores achieved by the Teaching Company Scheme.

relatively short and it finances collaborative agreements. LINK is ranked the lowest because although it also finances collaborative agreements it does not generally perform well against other criteria: in particular the processing time is protracted (see Figure 19), the administration costs are high and the rate of commercial exploitation is relatively low (see Figure 10).

How improvements in the schemes might be secured

4.15 The National Audit Office considered by reference to Table 5 how improvements in the cost effectiveness of schemes might be secured. The scores achieved by schemes under certain performance indicators in part reflect the design of the schemes. For instance, the relatively low preference score achieved by Managing in the 90s on the project and product related performance indicators can be attributed to the absence of funded projects under this scheme. Similarly, the relatively low commercial exploitation preference score achieved by the LINK scheme can, in part, be attributed to the distance from market at which this scheme operates.

4.16 Nevertheless, the National Audit Office identified the following key points for improving cost effectiveness which have broad relevance:

- the high weightings attached to programme and running costs emphasise the importance of minimising deadweight for technology development schemes, and maximising administrative efficiency for all schemes. Part 5 explores these points in more detail;

- the relative performance of the LINK scheme is less good in these regards: recent Office of Science and Technology proposals (see paragraph 5.8) may help with administrative problems, but the high deadweight should also be addressed;

- within the group of innovation indicators, those relating to projects and products are weighted higher than those dealing with transfer of information;

- access schemes are likely to do better if they are targeted in terms of topic and audiences in a way that maximises the chance of changes to business practices or use of technologies. The way the Teaching Company Scheme combines development and access elements seems well suited to this purpose. Better targeting of potential participants is discussed in Part 3;

- there appears to be scope to increase ratings for project completion and commercial exploitation for SPUR and LINK, to bring them close to the levels obtained by the other two technology development schemes. Part 5 explores one way of achieving this, by improving the quality of application appraisals.

4.17 In order to get greatest value from their experiences under individual schemes, the Department should investigate further the use and development of the comparative cost effectiveness methodology used in this study. This work would build on the Department's existing evaluation arrangements, and the results would feed into budgeting and resource allocation systems.

Part 5: Administration of the schemes

5.1 The National Audit Office examined the Department's efficiency in administering the eight selected schemes. In general they found that, at the time of their fieldwork in early 1994, the Department administered the schemes well. In particular, grant applications were usually appraised in line with laid down procedures and scheme eligibility requirements; and the progress of funded projects, activities, events and schemes were, in most cases, well monitored. However, the National Audit Office noted aspects of the process which affected the cost effectiveness of certain schemes, as set out in the earlier parts of this report. These are considered in more detail below.

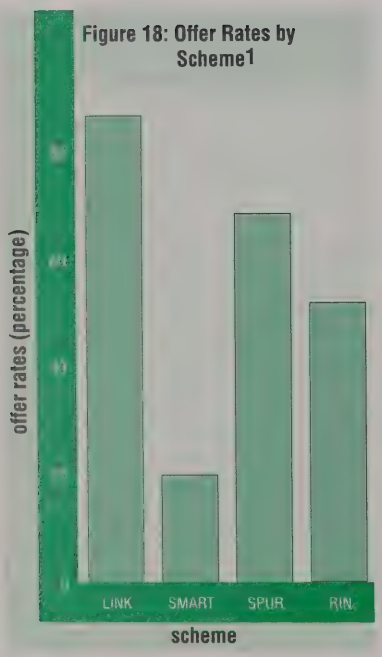
Project appraisal procedures

5.2 Appraisal procedures for applications to the eight schemes examined are set out in Appendix 4.

Appraisal of technology development projects

5.3 Although appraisal criteria are used to judge the quality of applications for funding under the SPUR, SMART and RIN schemes, applications for the SPUR and RIN schemes are usually funded provided they meet the eligibility criteria drawn up by the Department. However, for the competitive scheme, SMART, a formal marking system is used to appraise the quality of projects and this helps to determine which applications will be funded and which will be rejected. Figure 18 shows the differing offer rates which result from these approaches in the four years to 31 March 1994 and, for completeness, the offer rate for LINK.

Figure 18: Offer Rates by Scheme1



Source: National Audit Office's analysis of the Department's management information.

Note (1) The offer rate is the percentage of grant applications which result in an offer of funding from the Department

Figure 18 shows the differing offer rates between the schemes. In particular it shows the low offer rate for SMART which reflects the competitive nature of the scheme.

5.4 In the view of the National Audit Office, a more formalised marking system for LINK and SPUR should be introduced because:

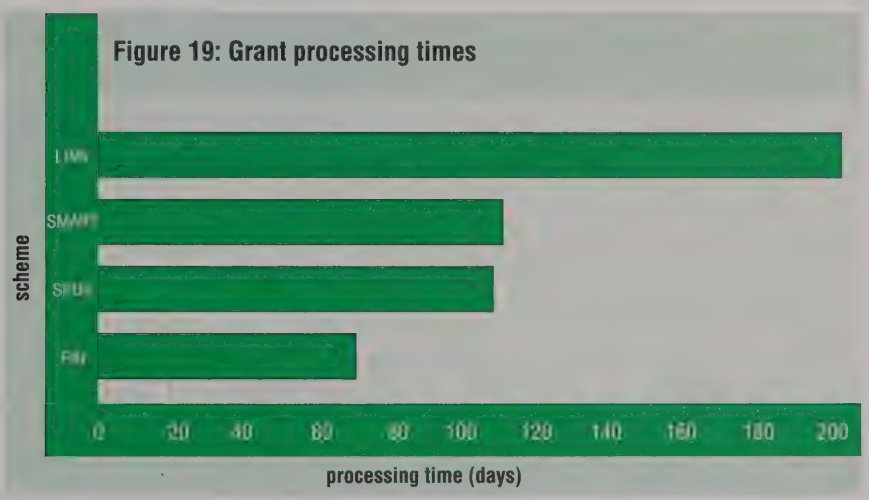
- it could assist in setting a minimum quality standard for proposed projects and provide the Department with information both to track the quality of industry's projects and monitor the consistency of project appraisal;

- better quality projects should also have a greater chance of success. This in turn should increase the cost effectiveness of the schemes through increases in the rates of project completion and commercial exploitation (see paragraph 4.16); and

- greater awareness of the schemes (paragraph 2.12) would generate more applications. The Department would need a more robust means of identifying the projects it should fund.

The processing of applications

5.5 The National Audit Office analysed the processing time by scheme for all applications received in the four years to 31 March 1994. The results are set out in Figure 19.



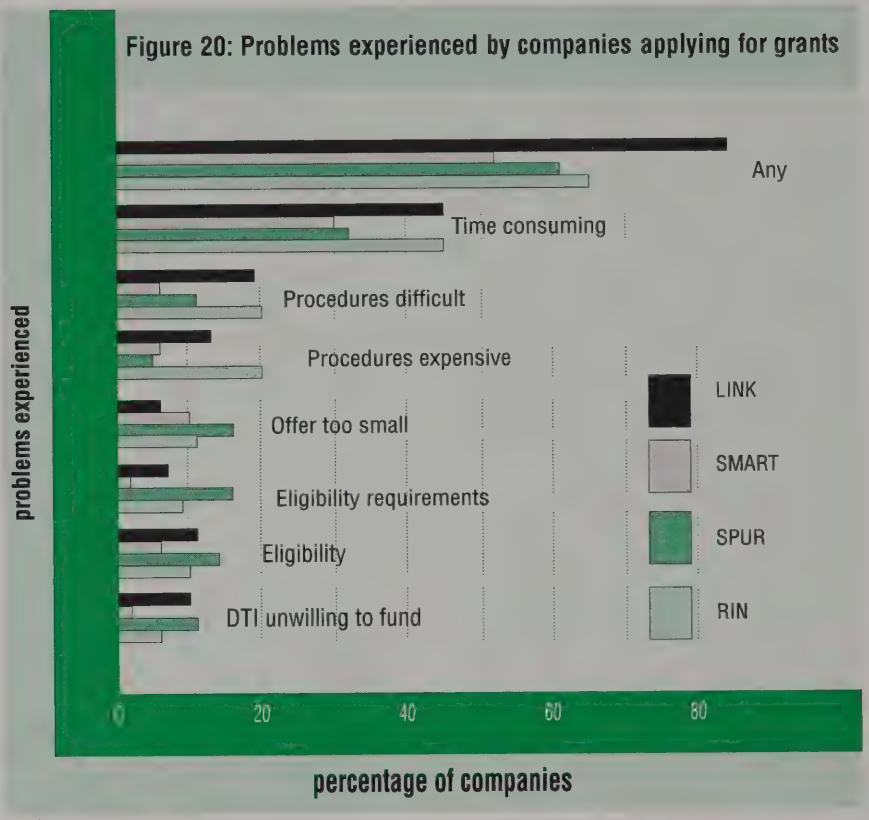
Source: National Audit Office.

Figure 19 shows the average time to process a grant application for each scheme. In particular it shows the relatively high processing time for LINK compared with other technology development schemes.

5.6 Two-thirds of technology developers receiving funds from the Department who participated in the National Audit Office survey claimed, when prompted, to have experienced problems during their negotiations with the Department. A major difficulty they experienced was the processing time for applications. This is illustrated at Figure 20 overleaf.

5.7 The application process for LINK and RIN were perceived as significantly worse than for SMART or SPUR. In the case of RIN, which had the shortest absolute time for application processing of schemes examined, dissatisfaction is most plausibly explained by the

Figure 20: Problems experienced by companies applying for grants



Source: National Audit Office survey.

Figure 20 shows the problems experienced during the application process by the companies applying for grants interviewed as part of the National Audit Office survey.

timescale relative to normal business practice: RIN is targeted at small companies undertaking relatively straightforward projects where there may be expectations of quick decisions.

5.8 The processing time for LINK project proposals was the longest of the technology development schemes examined. This can partly be explained by the lengthy internal approval arrangements set out in Appendix 4. This finding is supported by a recent review of the LINK scheme by the Office of Science and Technology, who confirmed that administrative delays are a significant problem for the scheme. They have made recommendations designed to streamline the approval arrangements set out in Appendix 4 for which the Government is committed to their early implementation. These changes should reduce both the processing time for the LINK project proposals and the administration costs borne by the Department. These in turn should improve the cost effectiveness of the LINK scheme (see paragraph 4.16).

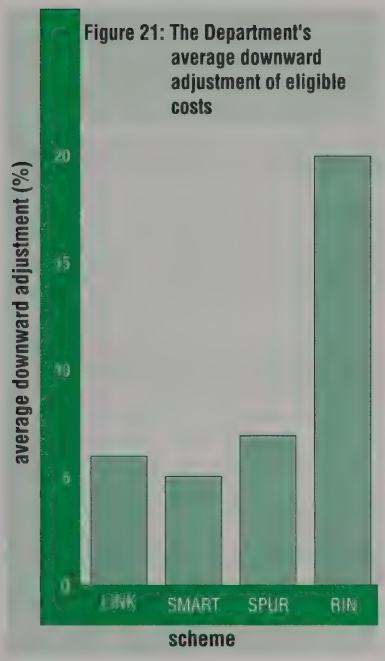


Figure 21: The Department's average downward adjustment of eligible costs

Source: National Audit Office.

Figure 21 shows the Department's downward adjustment of companies' assessments of eligible costs.

Grant levels for technology development projects

5.9 The level of grant received by technology developers is determined solely on the basis of eligible costs. For each scheme the Department have drawn up a definition of eligible costs. Figure 21 shows the impact of the Department's adjustments to companies' assessment of eligible project costs. Although the average adjustment for all the schemes was downwards, with the exception of RIN, the companies' assessments of eligible cost are generally similar to those of the Department; the average downward adjustment being well under 10 per cent.

5.10 For each scheme the Department have designated the percentage of eligible costs which they are prepared to fund, which are similar to those funded by the European Commission and other countries. For all the technology development schemes except LINK the Department have also determined a financial ceiling up to which they will fund eligible costs. These are set out in Figure 22.

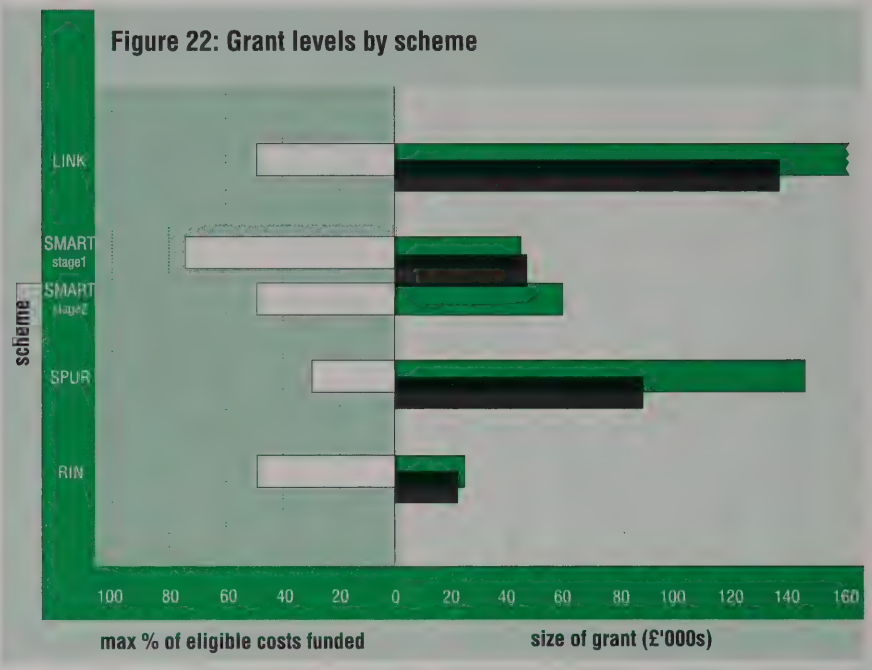
5.11 With the exception of those LINK projects whose eligible costs exceed £0.5 million, no discretion is given in the schemes examined by the National Audit Office to vary the percentage of eligible costs funded. The guidelines leave little room for flexibility in assessing the most effective level of funding within a ceiling and thereby the level of grant which should be awarded. This may contribute to the extent of deadweight noted in paragraphs 3.26 and 3.27, which impacts on the cost effectiveness of the LINK, SPUR and SMART schemes. The deadweight results for individual schemes suggest that the mechanism of fixed grant levels adopted by the Department contributes to lower deadweight for schemes targeted at smaller companies and small and straightforward projects.

5.12 Although it is not possible to eliminate deadweight by scheme design, the Department might consider adopting more flexible funding within a ceiling for medium sized and larger companies and those projects involving more uncertainty to facilitate a reduction in deadweight and hence an improvement in the cost effectiveness of the schemes (see paragraph 4.16).

Costs of administration

5.13 The actual administrative costs associated with the eight schemes examined are not readily available since the Department's costing system, MINIS, does not allocate costs to individual schemes.

Figure 22: Grant levels by scheme



KEY

Maximum grant available

Average grant awarded

Percentage of eligible costs the Department is prepared to fund

Source: National Audit Office.

Note: The two sets of bars for SMART represent the details for the two stages of SMART; stage 1 and stage 2 (see Figure 3). No separate analysis of the average grant awarded is available.

Figure 22 shows the maximum grant available under each scheme and the average grant awarded. It also shows the maximum percentage of eligible costs the Department is prepared to fund under each scheme.

Estimates of such costs have been made with the help of the Department, and are set out in Table 6 opposite. Accurate information on the overall costs of the schemes is an important element of an effective management information system. Accordingly, the Department should consider adapting their existing system to generate the necessary cost information to determine more accurately the overall costs of each of their schemes.

5.14 Administrative costs for Managing in the 90s appear high compared with programme costs. However, unit costs are low because of the relatively high level of participation. In comparison, unit costs for LINK are high because administrative costs are high, partly because of the nature of the process set out in Appendix 4, and also because

the number of grant applications is relatively low. The level of administrative costs for LINK contribute to that programme's relatively low cost effectiveness.

Table 6: Unit costs by scheme

Scheme	Annual Programme Costs[1] £000	Annual Administrative Costs[2] £000	Total Annual Costs £000	Annual Number of Applicants or Participants[3]	Overall Annual Unit Costs[4] Admin £000	Total £000
LINK	15,600	5,000	20,600	315	15.9	65.4
SMART	12,500	1,000	13,500	3,455	0.3	3.9
SPUR	7,300	1,000	8,300	240	4.2	34.6
RIN	5,000	500	5,500	575	0.9	9.6
Biotechnology Means Business	160	40	200	740	0.1	0.3
Manufacturing Intelligence	300	44	344	1,015	0.1	0.3
Managing in the 90s (phase 2)	3,100	1,000	4,100	15,000	0.1	0.3
Teaching Company Scheme	5,000	250[5]	5,250	1,250	0.2	4.2

Source: The National Audit Office's analysis of the Department's financial and participants records for the three years to 31 March 1994 and discussions with the Department.

Notes: (1) These costs include the costs of consultants employed by the Department to manage certain programme elements and other direct costs of the scheme.

(2) Staff costs, including Regional Office elements, attributable to the scheme as estimated by the National Audit Office and the Department.

(3) Average number of grant applicants to technology development schemes or participants in Department sponsored technology transfer or best practice events or activities.

(4) Estimated on the basis of costs per technology development grant applicant or technology transfer/best practice participant.

(5) New liaison arrangements for the Teaching Company Scheme will increase administrative costs borne by the Department.

Table 6 shows the significant variations in the overall unit costs of the schemes examined by the National Audit Office.

Appendix 1

Survey of industry

Background

1 The National Audit Office commissioned IFF Research Limited to undertake a telephone survey (the Survey) of industry to ascertain:

- industry's views on and awareness of the change in policy emphasis and their awareness of the Department's schemes;
- industry's view of the Department's management of the schemes; and
- the outcome of industry's participation in the Department's schemes.

2 Key results are included in Parts two to five of this report.

Methodology

3 The Survey was designed to obtain the views of companies from the advanced manufacturing and biotechnology sectors falling into the following three categories:

a) suppliers (or **developers**) of technology who had applied to the Department for financial assistance under one of four grant schemes during the period April 1990 to December 1993;

b) developers who had not so applied; and

c) companies who were customers (or **users**) of technology developed by companies of the type described in categories (a) and (b) above.

4 In consultation with the Department, telephone questionnaires were finalised following exploratory telephone interviews. The telephone interviews were carried out by 42 IFF Research executive interviewers in the period March to July 1994 among senior technical managers in the three categories of companies set out above. The survey was stratified both by technology sector

(advanced manufacturing and biotechnology) and company size. The details of the sample structure and source by sample category are set out in Table 7 below.

Table 7: Sample structure and sources

Sample Category	Responses	Technological Sector		Company Size[1]		Sample Source
		Advanced Manufacturing	Biotechnology	Less than 250	250 or More	
Developers - Applied	402	314	88	346	56	The Department's record of grant applicants.
Developers - Not Applied	108	71	37	72	36	Dun & Bradstreet
Users - Pure	75	56	19	43	32	Dun & Bradstreet
- Booster	75	50	25	47	28	The Department's record of participants in technology transfer and best practice awareness schemes
	150	106	44	90	60	
OVERALL	660	491	169	508	152	

Notes: (1) Company size by number of employees

Source: IFF Research Limited

Table 7 shows the number of companies responding to the telephone survey according to their sample category, technology sector and size.

5 The telephone survey was complemented by in-depth interviews with 20 companies. These provided evidence to amplify and illustrate the statistical findings of the Survey.

Statistical validity

6 Survey interviews were carried out on a geographically random basis and 1,105 companies were initially contacted for interview having been randomly selected from the sources described in Table 7 above. The 660 companies interviewed represented a response rate of 73 per cent after taking account of those which did not qualify for interview or could not be contacted. The likelihood of non-response bias is reduced with such a high response rate and IFF Research Limited believed the sample to be representative.

Table 8: Sampling Error

Sample Category	Estimated Sampling Error %
Developers - Applicants	+ or - 4 to 5
Developers - Non Applicants	+ or - 8 to 10
Users	+ or - 6 to 8
Overall	+ or - 3 to 4

Source: IFF Research Limited

Table 8 shows the sampling error both for the main sample categories and the overall sample.

7 The sampling errors for the overall survey sample are estimated to be less than + or - 3.0-4.0 per cent at the 95 per cent confidence level. The estimated sampling errors for the three sub-categories at the same confidence level are set out in Table 8.

The survey

8 Material covered by the Survey included:

- industry's awareness of, and views on, the changes made to the Department's support for innovation;
- industry's awareness of, and understanding of, the technology development and technology transfer schemes, and the distinction between them;
- the appropriateness, efficiency and adequacy of the Department's grant application procedures, and how they might be improved;
- use of European Commission grants;
- the appropriateness of grant eligible and non-eligible project costs;
- the additionality of the Department's support and whether funding is at the minimum effective level;
- reasons for Department funded projects not being completed or for non-participation in a technology transfer or best practice scheme;
- the extent to which direct funding of projects results in increased competitiveness through commercial exploitation of the product;
- the extent to which participation in technology transfer and best practice awareness results in increased competitiveness through implementation or adaptation of the technology or best practice; and
- whether the Department's technology development or technology transfer schemes are targeting the technologies that the market needs.

Appendix 2

The comparative cost effectiveness of the Department's innovation schemes

Terms of reference

1 Recognising the weaknesses in their existing evaluation system (paragraph 4.3) the Department formed a joint working group (the Group) with the National Audit Office early in 1994. The Group was tasked with developing appropriate performance indicators and a methodology for measuring the comparative cost effectiveness of the Department's innovation schemes in delivering their objectives of stimulating industrial innovation and increasing the competitiveness of United Kingdom industry. The methodology developed was applied to the eight schemes described in Figure 3 and involved the following tasks:

a) the identification of criteria which can be used as the basis for a system of performance indicators for determining the cost effectiveness of the Department's innovation schemes;

b) the examination of the extent to which the criteria and performance indicators referred to above properly reflect the performance of the Department's innovation schemes in terms of cost effectiveness;

c) the devising of a methodology for assessing the comparative cost effectiveness of the Department's innovation schemes, incorporating the identified criteria and performance indicators; and

d) the assessment of the comparative cost effectiveness achieved by the Department's innovation schemes using the methodology devised in (c) above.

2 The National Audit Office commissioned Facilitations Limited and an academic consultant from the London School of Economics to assist in this exercise.

Methodology

3 The approach adopted by the Group was based on an extension of decision theory which allows options, such as innovation schemes, to be evaluated and compared when they differ on evaluation criteria, such as performance indicators.

Performance criteria and indicators

4 Two over-arching objectives were identified:

- minimising costs; and
- maximising innovation and competitiveness.

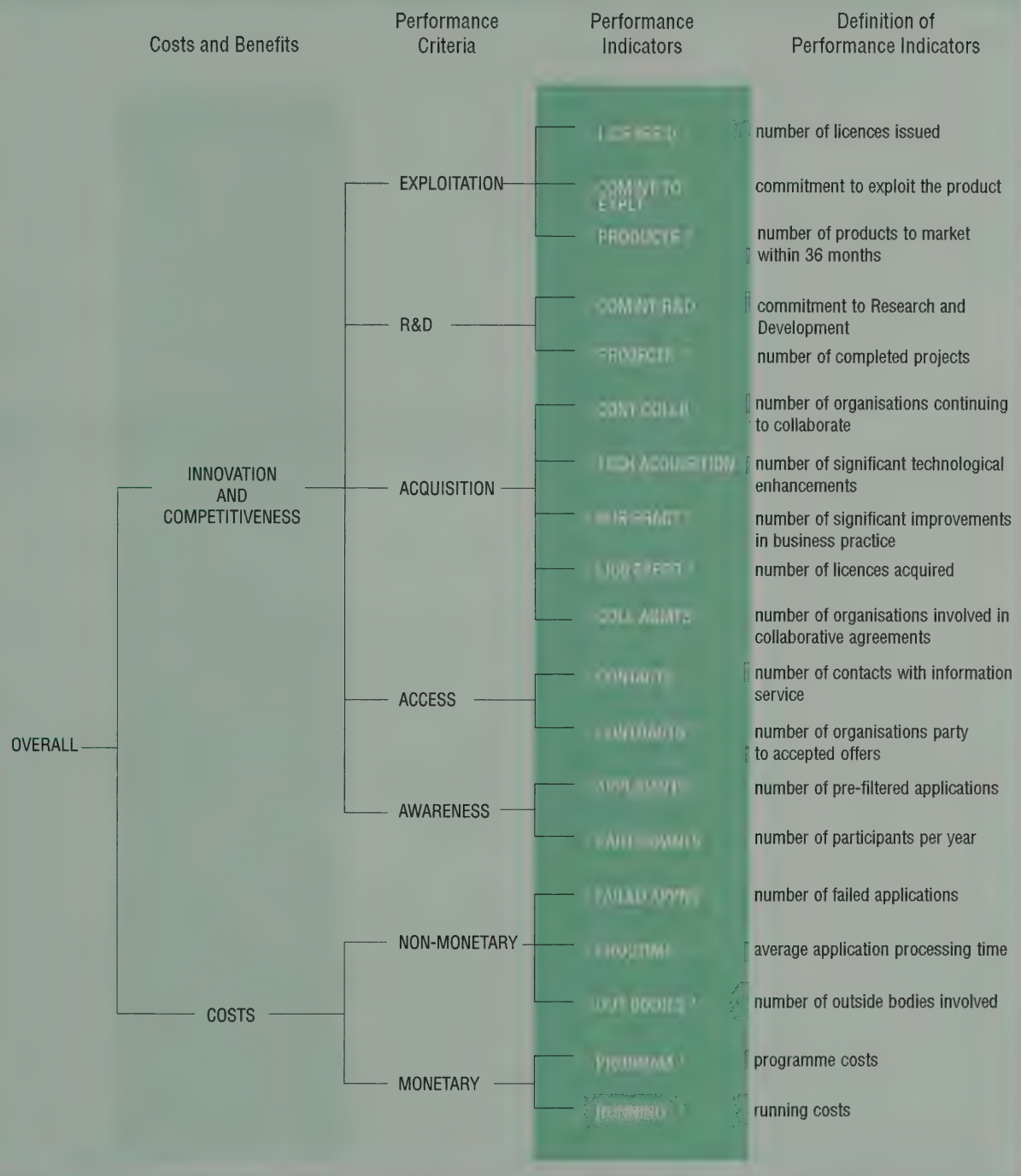
It is the balance of these that determines the comparative cost effectiveness of any particular scheme. To develop performance indicators, these objectives were broken down into a number of different performance criteria. Each criterion could be measured by performance indicators. Seven criteria and 19 performance indicators relating to them were developed for the model. The criteria and performance indicators are shown in Figure 15, which for convenience is repeated (opposite).

Comparative cost effectiveness

5 The evaluation of an individual scheme's relative cost effectiveness comprised four stages. The first used available data to assign values to the schemes for each performance indicator.

6 In the second stage, the values on a given indicator were transformed onto "preference scales". These are relative scales with a preference score of 100 representing the most preferred scheme in terms of a particular indicator and a preference score of 0 representing the least preferred scheme. It should be emphasised that these scores are relative values: 0 does not necessarily mean no effectiveness, it simply means the lowest performance on a particular indicator relative to the other schemes. The remaining schemes were usually placed on each preference scale as a linear function of their performance indicator value (see Figure 23 on page 54). This means, for instance, that a scheme whose performance on a particular indicator was half way between the least and most preferred scheme was assigned a preference score of 50 on that indicator's preference scale.

Figure 15: Hierarchical representation of performance criteria and indicators

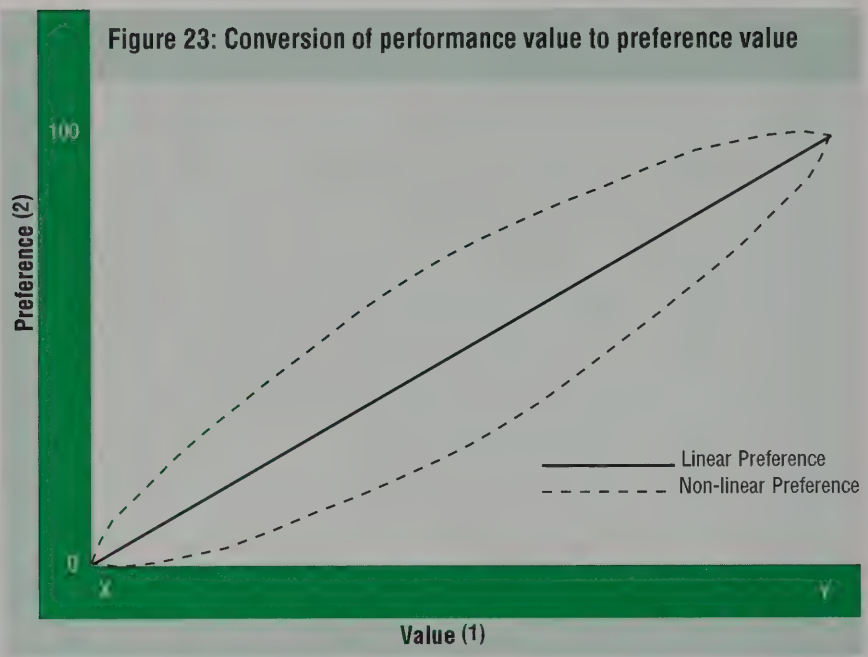


**Identifies the 12 most important indicators (see paragraph 4.14).*

Source: The Group.

Figure 15 shows the hierarchical structure of the comparative cost effectiveness model. In particular it shows the interrelationship between the individual performance criteria and their related performance indicators and the latter's definitions.

Figure 23: Conversion of performance value to preference value



Source: National Audit Office.

Notes:
(1) The horizontal axis represents the value of the indicator for each of the schemes. Value X represents the scheme with the lowest value on this particular indicator whilst value Y represents the scheme with the highest value on this indicator
(2) See paragraph 6 above.

Figure 23 shows in general terms the options for converting the value of each scheme on each indicator to a preference value . This can be done linearly, as represented by the straight line, or non-linearly, as represented by the curved lines. In most cases the Department's schemes were placed on the preference scale for each indicator as a linear function of their performance indicator value (see paragraph 6 above).

7 The next stage required each performance indicator's preference scale to be weighted by the Group so that each scale could be directly compared with another. This involved assigning a weight of 100 to the indicator with the most preferred range of values. The remaining indicators were then assigned weights relative to this on the basis of the range of values for each indicator and the Group's preference for that range compared to the ranges on other indicators. This process was carried out separately for the cost and benefit side of the hierarchy.

8 Finally, the weighted preference scores were combined to give an overall weighted average score for each scheme, based on equal weights (50/50) assigned to the overall objectives of costs and innovation.

Analysis of comparative cost effectiveness

9 The overall comparative cost effectiveness of the schemes was assessed by comparing the scores achieved by each. The particular aspects of performance under which individual schemes were performing well or poorly relative to the other schemes were identified by examining the scores achieved by each scheme on individual indicators.

10 Possible improvements to the schemes were identified by varying the values of the indicators and plotting the changes in the overall weighted average score.

Appendix 3

Overall and Specific Objectives by Scheme

Scheme	The Scheme's Overall Objectives	The Department's Specific Primary Objectives and Non-Financial Targets
LINK	To help the United Kingdom exploit developments in science and technology, bridging the gap between industry and the research community. Specifically LINK aims to: • provide a framework for collaborative research programmes and projects in key areas of science, technology and engineering; • enable and accelerate the commercial exploitation of science and technology, leading to new products, processes, systems and services; • promote a close interaction between industry and the research base, so that nationally supported programmes of basic research are influenced by awareness of the needs of industry; • use the research base effectively and to increase UK industrial competitiveness; and • stimulate industry to increase its own investment in R&D.	Each LINK programme (see Appendix 4) has its own set of objectives. However the Department had not put in place specific overall objectives for the portfolio of LINK programmes that they support.

continued

Overall and Specific Objectives by Scheme

Scheme	The Scheme's Overall Objectives	The Department's Specific Primary Objectives and Non-Financial Targets
SMART	To stimulate small firms to develop and market new science and technology based products; to encourage and facilitate the formation of viable and durable, science and technology based small firms; and to contribute to a climate which encourages investment in highly innovative technology by individuals, firms and financial institutions.	• to stimulate at least 25% more worthwhile ideas per year meriting a Stage I award than there are awards available; • by the end of each Stage II, to have caused at least 10% of the Stage I winners in that competition to be viable small firms established or registered after winning; • to stimulate at least one-third of Stage I winners to market a SMART-derived product within three years of getting the award; and • to achieve ratings for "value for money" and "innovation" at least equal to those achieved in the 1990 evaluation and on the same basis.
SPUR	To encourage more small and medium sized enterprises (SMEs) to undertake more research and development and develop new products and processes to benefit the national economy.	• to support at least 60 projects in the first full year of the scheme and 150 projects annually by the third year which lead to a significant technical advance; • to stimulate at least £25 million per year additional investment in research and development by SMEs by the third year; • at least 80 new products to be marketed successfully by firms (grant holders and other firms) within two years of the end of the initial three year scheme; • to generate additional profits in the companies supported, which when aggregated over the four years following the end of the project, amount to three times the grant; • 70% of projects to achieve most or all of their specified technical objectives; and • to streamline administrative procedures so that at least 75% of offers are made within four months of the date of the initial application.

continued

Overall and Specific Objectives by Scheme

Scheme	The Scheme's Overall Objectives	The Department's Specific Primary Objectives and Non-Financial Targets
RIN	To improve the performance of small businesses in qualifying areas through the introduction of successful new products and processes leading to the increase or safeguarding of employment.	To encourage: • improved efficiency and profitability; • increased turnover; • employment growth/safeguarding jobs; and • lessening the risk of stagnation or decline.
Biotechnology Means Business (phases 1 and 2)	To ensure that United Kingdom industry is in a position to maintain its lead in the increasingly competitive field of biotechnology by facilitating the efficient dissemination of information and provide support for effective technology transfer to industry; to provide appropriate techno-economic and market information to SMEs; to provide independent fora for information exchange , steerage and discussion on biotechnology; to improve industrial competitiveness through promotion of best practice; and reduce industrial risk by promoting demonstrator and feasibility projects.	• to establish a database of 2000 companies to be targeted in the sectors identified: 25% to have attended an organised event or requested specific information and 10% to have acknowledged that biotechnology has influenced investment decisions; • to achieve at least 60% satisfaction rate from those attending seminars, workshops, exhibitions and from those requesting publications; • to publish a revised "Plain Man's Guide"; • to publish four newsletters per year; • to support five demonstrator projects, each involving at least two partners (one industrial) in the live demonstration of prototype equipment and processes in biotechnology and promotion of quality assurance through adoption of best practice; • to commission and publish five state-of-the-art reports for dissemination to industry, particularly SMEs, to spread awareness of the benefits offered by biotechnology; • to provide for 19 projects involving the employment by companies of experts to undertake strategic studies which will provide techno-commercial information for informed decisions about future investments; and • to provide for 21 projects involving the employment by companies of external expertise to undertake technical feasibility work.

continued

Overall and Specific Objectives by Scheme

Scheme	The Scheme's Overall Objectives	The Department's Specific Primary Objectives and Non-Financial Targets
Manufacturing Intelligence	To increase manufacturing industry's knowledge of the advantages of new technology, thus reducing fear of it: to encourage strategic decision makers and operational managers to consider the opportunities knowledge based systems technology offers for improving the competitiveness of their companies.	• to distribute in the first year to 3300 medium-sized companies (200-499 employees), and other organisations associated with the scheme, a high quality information pack; • 12 issues of 2000 copies of a newsletter will be published over the life of the scheme and distributed to manufacturing companies and associated organisations; the projected readership is 6000 individuals; • to demonstrate operational applications at first hand to companies considering implementing a knowledge based system solution in a particular area. It is anticipated that there will be 300 visitors to the host companies in years 2 and 3 of the scheme; • to set up six technology transfer clubs whose aim is to spread awareness of Manufacturing Intelligence among their members and provide a forum for mutual help and provide a mechanism for members to gain practical experience in building knowledge based systems. The aim is to have 300 companies join these clubs of whom 50 will implement systems by way of joint venture activities. In addition, the clubs will hold 12 seminars; • to have up to 12 application oriented collaborative projects exploring novel applications in manufacturing established by the end of the second year in which 50 companies will participate. The results to be disseminated via the newsletter; • of the 650 target companies, it is expected that some 150 will build or be building operational systems by the end of the scheme. Reportage of about 50 of these systems will demonstrate the opportunities afforded from using the technology and provide the basis for its spread to other medium-sized companies;

continued

Overall and Specific Objectives by Scheme

Scheme	The Scheme's Overall Objectives	The Department's Specific Primary Objectives and Non-Financial Targets
		• the annual competition for the Manufacturing Intelligence Award will continue. The competition encourages companies with successful systems to declare these, so providing evidence of real business benefits and lessons learned. The target is to have a minimum of 30 entrants per year of a very high standard to publish the Executive Summaries. 4000 copies of the Executive Summaries will be distributed each year on a complimentary basis and on sale through HMSO; and • the scheme will aim to have 80% of those completing exit questionnaires for the Department of Trade and Industry events rate them as beneficial.
Managing in the 90s (phase 2)	To contribute to an improvement in the competitiveness of British business by encouraging its target audience to address key management issues vital to success. To improve awareness of the need to manage change effectively, to promote understanding of aspects of management practice important to competitive success and to encourage action to improve performance.	• at least 75% of those attending seminars and workshops will rate them as good or very good in respect of presentation and that at least 70% will rate them good or very good in respect of content; • 60% of those attending seminars and workshops should take action following their attendance, of whom 70% shall consider themselves to have been materially influenced by the event; • 70% of attendees to demonstrations should consider the content good or very good and that 60% should subsequently take action; • to visit at least 30 sites with the strategy roadshow with total attendance of at least 6000 people (1993-94 target); • to hold at least 80 other seminars and workshops with total attendance of at least 4500 people (1993-94 target); • to organise at least 400 visits to demonstration firms involving at least 3000 attendees (1993-94 target); • to dispatch at least 400000 booklets and loan 30000 videos to interested companies (1993-94 target);

continued

Overall and Specific Objectives by Scheme

Scheme	The Scheme's Overall Objectives	The Department's Specific Primary Objectives and Non-Financial Targets
		• to create a new private sector quality award, building on the achievements of the British Quality awards; and • to promote marketing and new production introduction as full topics within the programme.
Teaching Company Scheme	To facilitate the transfer of technology and the spread of technical and management skills and encourage industrial investment in training, research and development; to provide industry based training, supervised jointly by academic and industrial staff, for young graduates intending to pursue a career in industry; and to enhance the level of stimulating collaborative research and development projects and forging lasting partnerships between academia and business.	• targets set for the number of programmes, new companies and new academic institution departments supported by the scheme overall in the years 1991-92 to 1995-96. The Department support the majority of these programmes; and • 60% of all live programmes to have industrial partners whose total number of employees do not exceed 500 in the company or ultimate group.

Source: the Department's Statements of Objectives for each scheme.

Appendix 3 shows by scheme the overall scheme objectives and the Department's specific primary objectives and non-financial targets, where these are specified.

Appendix 4

Appraisal criteria and procedures for technology development schemes

1 The appraisal criteria and procedures for the four technology development schemes examined by the National Audit Office are described below.

LINK

2 The LINK scheme comprises a number of technology specific programmes each with its own management committee and each supporting a number of individual collaborative projects. Each management committee uses a project co-ordinator who assists in the formation of a collaborative group to undertake LINK projects although the extent to which this support is provided varies from project to project and between programmes. The appraisal and approval arrangements for each project proposal are summarised in Figure 24 opposite. Projects cannot proceed until both the Department and the relevant research council have completed their appraisals and given their approval.

Appraisal of project proposals

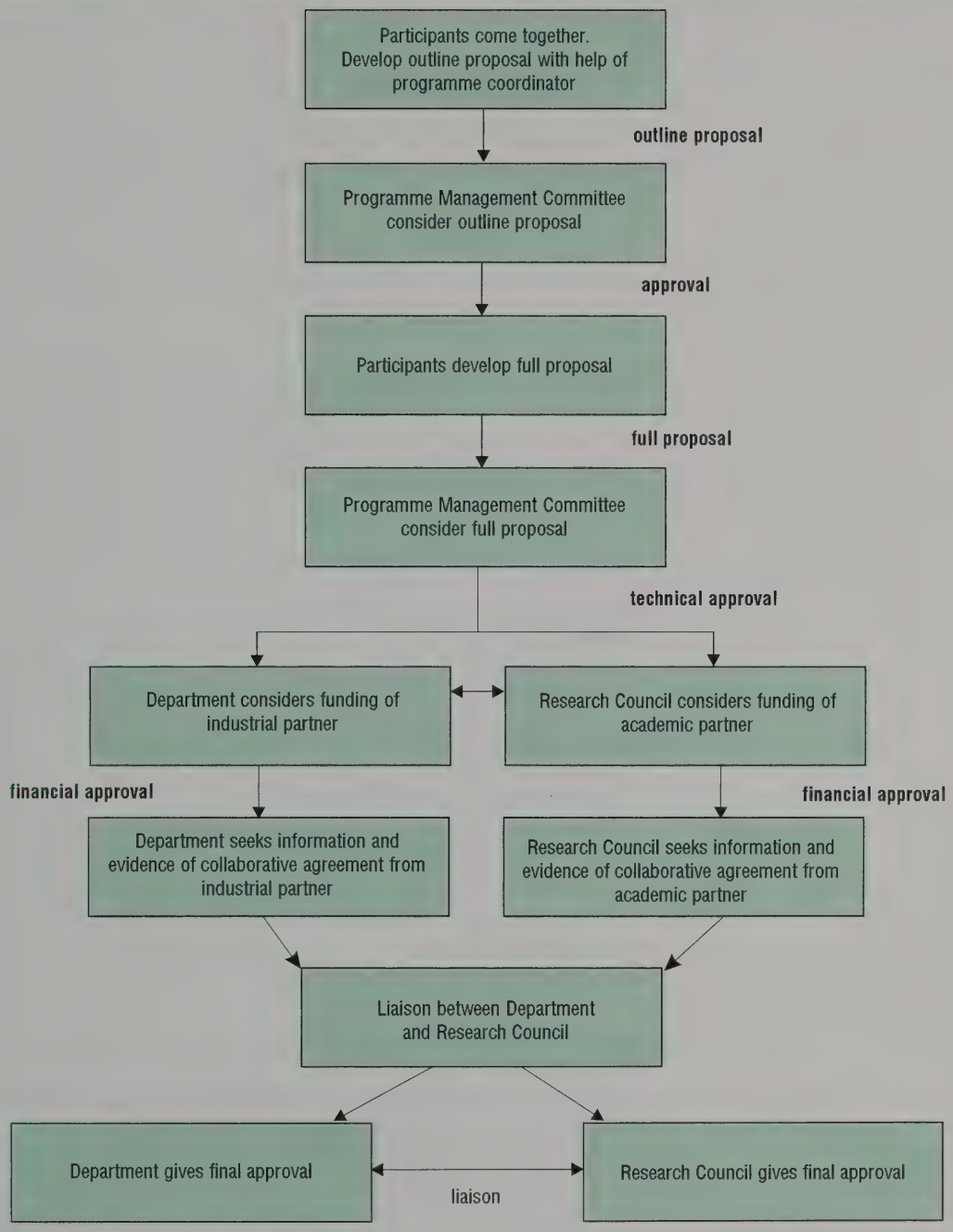
Technical Approval

3 The management committees are responsible for the technical appraisal of the project proposals. The appraisal concentrates on the technical viability of the project and whether it falls within the remit of the programme. It also assesses the commercial viability of the project although the depth of appraisal can vary according to the particular management committee involved and whether the proposal is at outline or full stage.

Financial and Contractual Appraisal

4 If the full proposal receives the approval of the management committee it is then appraised on financial grounds both by the Department and relevant research council simultaneously. The Department's appraisal concentrates on the industrial partner and is carried out against the following criteria: additionality; project costs and their allocation between the partners; the project timescale; the contractual collaborative arrangements, including the roles of the

Figure 24: Arrangements for financial and technical appraisal and approval of LINK projects



Source: The Office of Science and Technology and the National Audit Office.

Figure 24 shows the lengthy appraisal and approval arrangements for individual collaborative projects under the LINK scheme.

individual collaborators, with particular reference to SMEs and managerial arrangements; intellectual property rights; and the financial viability both of the project and the individual companies.

SMART, SPUR and RIN

5 The quality of project proposals under the SMART, SPUR and RIN schemes are appraised by regional offices on the basis of formal applications submitted by the companies concerned. The specific criteria applied under each scheme are set out in Table 9 below. In all cases the Department also appraise the companies' assessment of their eligible project costs.

Table 9: Appraisal Criteria by Scheme

Appraisal Criteria	Scheme		
	SMART	SPUR	RIN
Innovativeness (1)	•	•	•
Additionality	•	•	-
Management Ability and Company Expertise	•	•	-
Commercial Viability of Project	•	•	•
Technical Viability	-	•	•
Financial Viability of Project	•	•	-
Financial Viability of Company	•	•	-
Intellectual Property Rights	•	•	-
Business Plans	•	•	•
Marketing Proposals	•	•	-
Improved Efficiency and Profitability	-	-	•
Increased Turnover	-	-	•
Employment Growth	-	-	•
Reduced Risk of Stagnation	-	-	•

Source: the National Audit Office.

Note: (1) The innovativeness test is less stringent for RIN than the other two schemes. For SMART, the project must be innovative for the United Kingdom as a whole whilst SPUR applicants must demonstrate a significant technological advance. For RIN, applicants need only demonstrate that the project is innovative for the company.

Table 9 shows the specific appraisal criteria applied under the SMART, SPUR and RIN technology development schemes.

6 The SMART scheme is a competitive scheme - applications must be submitted to the Department by a set date each year and only a fixed number of grants are awarded each year. To identify the winning applicants a formal marking system is used to appraise the quality of the project proposals using the specific criteria set out in

Table 9 above. Project proposals under the SPUR and RIN schemes are not formally marked and ranked in this way - each proposal is assessed on its own merits against the related appraisal criteria.

Information required for appraisal of grant applicants

7 The information required by the Department to assess proposals under these four schemes includes:

- proof of eligibility (for instance, company size by number of employees);
- detailed project data, including:
  - duration and description of project;
  - business plans and cash flows;
  - contractual and financial details of collaborative arrangements (LINK); and
  - project costs by specified categories.

Reports by the Comptroller and Auditor General Session 1994-95

The Comptroller and Auditor General has to date, in Session 1994-95, presented to the House of Commons the following reports under Section 9 of the National Audit Act, 1983:

Printed in the United Kingdom for HMSO
Dd 5066859 8/95 C9 48003 51-8526

Department of Trade and Industry's Support for Innovation

HMSO

HMSO publications are available from:

HMSO Publications Centre
(Mail, fax and telephone orders only)
PO Box 276, London SW8 5DT
Telephone orders 0171 873 9090
General enquiries 0171 873 0011
(queuing system in operation on both numbers)
Fax orders 0171 873 8200

HMSO Bookshops
49 High Holborn, London WC1V 6HB
(counter service only)
0171 873 0011 Fax 0171 831 1326
68-69 Bull Street, Birmingham B4 6AD
0121 236 9696 Fax 0121 236 9699
33 Wine Street, Bristol BS1 2BQ
0117 9264306 Fax 0117 9294515
9-21 Princess Street, Manchester M60 8AS
0161 834 7201 Fax 0161 833 0634
16 Arthur Street, Belfast BT1 4GD
01232 238451 Fax 01232 235401
71 Lothian Road, Edinburgh EH3 9AZ
0131 228 4181 Fax 0131 229 2734
The HMSO Oriel Bookshop
The Friary, Cardiff CF1 4AA
01222 395548 Fax 01222 384347

The Parliamentary Bookshop
12 Bridge Street, Parliament Square,
London SW1A 2JX
Telephone orders 0171 219 3890
General enquiries 0171 219 3890
Fax orders 0171 219 3866

HMSO's Accredited Agents
(see Yellow Pages)

and through good booksellers

£9.70 NET

ISBN 0-10-020235-7

9 780100 202351